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Effects of Self-Regulation on Science Vocabulary Acquisition of Third Grade English Language Learners

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Effects of Self-Regulation on Science Vocabulary Acquisition of Third Grade English Language Learners

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To my parents, Jong-Dae Kim and Eui-Nam Hwang, for believing in me and giving me love, and my two sisters, Binna Kim and Mo-A Kim, for their support and patience.

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Effects of Self-Regulation on Science Vocabulary Acquisition of Third Grade English Language Learners

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The purpose of this study was to investigate the effects of self-regulation on the acquisition of academic vocabulary of ELLs with learning difficulties. Participants were four third-grade Spanish-speaking ELLs who performed below grade level on a vocabulary test in English and scored below 25% accuracy on a science vocabulary measure. This study employed a multiple probe design across subjects and it consisted of four phases: (a) baseline, (b) self-regulation training, (c) self-regulation, and (d) maintenance. During baseline, participants were provided direct vocabulary instruction. During training, self-regulation with prompts was added to the direct instruction and, during intervention, prompts were removed. The intervention continued until the maintenance phase. Each lesson included instruction of six target words followed by daily tests of those six words. Each session lasted 30-35 minutes, divided into 26-30 minutes for the lesson, followed by 4-5 minutes for testing. This study was conducted over 15 weeks; all lessons were implemented using a script.

To document students' progress on the acquisition of science vocabulary, two daily vocabulary tests were administered during every session. One was a receptive word-knowledge test to measure how many words students understood. The other was an

expressive word-knowledge test to measure how well the students understood the words. Furthermore, student interviews were conducted after completion of the study. Results revealed that self-regulation in conjunction with direct instruction was more effective than direct instruction alone not only on receptive word knowledge, but also on expressive word knowledge. Also, students showed a long-term effect in the acquisition of the both types word knowledge. Students had a positive perception of self-regulation, although they preferred different sub-strategies (self-goal setting, self-monitoring, and self-recording). These findings suggest that ELLs with learning difficulties need an intensive intervention beyond direct instruction alone and self-regulation is a critical strategy in formulating such an intensive intervention.

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CHAPTER 1: INTRODUCTION

Academic vocabulary— words that are used by teachers and students in content-area subjects (e.g., science and social studies)—is a tool that we use to acquire new knowledge, learn concepts, and express ideas. A student's ability to use vocabulary is crucial in academic success (Beck, McKeown, & Kucan, 2002; Stevens, Butler, & Castellon-Wellington, 2000; Stahl & Nagy, 2006). However, developing academic vocabulary is challenging for students (Beck, et al., 2002; Cummins, 1996), because they are exposed to the academic words limited times and the words themselves have unique characteristics (Beck et al., 2002; Ciechanowski, 2009). Difficulty in learning academic words may be greater for English language learners (ELLs) than English-only (EO) learners. Limited vocabulary knowledge, especially academic words, may contribute to underachievement among ELLs across content areas (August, Carlo, Dressler, & Snow, 2005; August & Shanahan, 2006; Lee, 2005). The 2009 National Assessment of Educational Progress (NAEP) report documented that 67% of fourth-grade ELLs performed below the basic level in science, suggesting that limited knowledge of academic vocabulary affected academic performance in content-area subjects such as science. These data demonstrate that the acquisition of academic words is important for ELLs, and that the development of effective vocabulary instruction is imperative for them to succeed in school.

Vocabulary Instruction for ELLs

Vocabulary knowledge is explained in two ways: depth and breadth. Breadth of vocabulary knowledge refers to how many words the students know (Coyne, McCoach, Loftus, Zipoli, & Kapp, 2009; Nagy & Scott, 2000). Depth of vocabulary knowledge refers to how well they know the words (Coyne et al., 2009; Nagy & Scott, 2000). The literature reported that ELLs performed significantly below English-only (EO) students in depth and breadth of vocabulary knowledge (August et al., 2005; Gersten et al., 2007).

Thus, the vocabulary instruction program for ELLs needs to be more extensive than the instruction conducted currently in schools (Gersten et al., 2007). Gersten, Baker, and Marks (1998) provided four principles for vocabulary instruction of ELLs: (a) focus on a small number of words, (b) provide exposure to target words multiple times and in diverse contexts, (c) introduce new words before students encounter them in reading, and (d) provide frequent opportunity to use the words. Beck et al. (2002) introduced a teaching method for increasing word knowledge by applying principles described above. First, the teacher introduces a word and describes its meaning, using student-friendly definitions (i.e., not a dictionary definition, but a definition that used their grade level vocabulary) to help early grades make sense of the word. Second, the teacher explains word meanings in diverse contexts (e.g., visuals-pictures or using story), taking into account the student's language development and word difficulty levels. Third, the teacher employs several activities for vocabulary teaching: (a) building new information based on

prior knowledge, (b) questioning and corrective feedback, and (c) creating sentences (Beck et al., 2002; Gersten et al., 1998).

One general teaching model proven largely effective for academic vocabulary with ELLs is direct instruction (August et al., 2005; Bailey et al., 2004; Carlo et al., 2004; Gersten & Baker, 2000; Linan-Thompson, Vaughn, Hickman-Davis, & Kouzekanani, 2003). Direct instruction is characterized by breaking the instruction down into simpler phases, teacher asking questions, administering feedback repeatedly, direct-teacher modeling, fast-paced instruction, providing individual instruction, and frequent review (Gersten et al., 1998; Gersten & Baker, 2000; Gersten et al., 2007; Swanson, 1999). Although the literature reflects that direct vocabulary instruction is generally effective, it may not be effective for all students in every subject. Rather, the effectiveness of the instruction varies depending on the difficulty level of the task and the students' academic achievement level (Gersten et al., 2007). The texts in content areas contain an advanced level of words compared to words in narrative text (Gersten, Fuchs, Williams, & Baker, 2001). Also, some ELLs may increase word knowledge with direct instruction; however, others who need additional support might require a more intensive intervention beyond just direct instruction (Gersten et al., 2007). Self-regulation is one strategy that has proven to be effective when used in tandem with direct instruction (Gajria, Jitendra, Sood, & Sacks, 2007; Gersten et al., 2001).

Self-Regulation

Others introduced cognitive and metacognitive strategies for ELLs' success in comprehension and production of academic texts (Chamot & O'Malley, 1996; Jimenez, Garcia, & Pearson, 1996). Self-regulation is a strategy acknowledged to influence language acquisition and subject-matter knowledge of ELLs in content areas (Chamot & O'Malley, 1996). Self-regulation was defined as the skill characterized by the ability to monitor, assess, and regulate one's own behavior (Field, Martin, Miller, Ward, & Wehmeyer, 1998; Graham, Harris, & Reid, 1992; Hallahan & Sapona, 1983; Schunk & Ertmer, 2000). Academically, self-regulation is a critical skill (Graham et al., 1992; Harris, Friedlander, Saddler, Frizzelle, & Graham, 2005; Konrad, Fowler, Walker, Test, & Wood, 2007; Sawyer, Graham, & Harris, 1992). Self-regulation acts as a bridge to close the gap between teacher-mediated strategy and student-independent learning (Anderson-Inman, 1986; Cole & Bambara, 1992; Gajria & Salvia, 1992). The strategy has proven effective in increasing students' academic engagement behaviors and attention span during academic activities, thus improving academic performance (Harris et al., 2005; Harris, Graham, Reid, McElroy, & Hamby, 1994; Konrad et al., 2007).

In the meantime, we need to address the fact that self-regulation has typically yielded stronger effects on academic achievement when used in combination with other instructional models (Gajria et al., 2007; Gersten et al., 2001). Self-regulation in conjunction with instructional approaches such as direct instruction has been shown to be more effective than the use of a single strategy in improving reading performance for

elementary, middle, and high school students (Gersten et al., 2001). The results of meta-analyses of intervention studies (Swanson, 1999) have suggested that the use of multi-component instruction, combining strategies such as cognitive instructional components (e.g., self-monitoring and meta-cognition) and direct instructional components (e.g., systematically-organized teaching routine, direct teacher modeling, and advance organizers) have the most impact on academic achievement.

Self-regulation consists of many strategies (components) such as self-goal setting, self-monitoring, self-instructions, self-evaluation, and self-reinforcement (Schunk & Ertmer, 2000). It has been developed to provide flexibility in selecting the appropriate components. For example, Sawyer et al. (1992) developed a self-regulation strategy incorporating self-instruction, self-goal setting, self-assessment, and self-recording. Harris et al. (2005) developed a self-monitoring strategy and defined it as one component of self-regulation.

To date, most research on self-regulation has been conducted with students with learning disabilities (LD) (Gajria et al., 2007; Gersten et al., 2001). Self-regulation's successful effect with that population suggests that it would be useful for ELLs. Cognitive Academic Language Learning Approach (CALLA), examined by Chamot and O'Malley (1996) was an instructional program designed to increase ELLs' achievement in content areas. One major strategy of the program was self-regulation; students' self-regulation consisted of planning, monitoring, and evaluating. The CALLA studies revealed that ELLs in the CALLA program outperformed those in general instruction on

academic language proficiency and academic achievement in content areas (Allen, 2003; Chamot & O'Malley, 1996). Self-regulation was also effective for ELLs in increasing their participation in the classroom, indicating that ELLs have an otherwise passive attitude in class despite their potential (Rodriguez, Ringler, O'Neal, & Bunn, 2009). When ELLs became engaged in the class with an active attitude, there was an improvement in their academic performance (Gersten & Baker, 2003; Konrad et al., 2007). These findings suggest that teachers use self-regulation to develop an intensive intervention for ELLs who need additional support.

Significance of the problem

NAEP results indicated that ELLs performed significantly below EO students in reading, math, and science since 1992. Limited vocabulary of ELLs was strongly related to low academic performance (August et al., 2005; Gersten et al., 2007). Despite the importance of vocabulary, teachers have focused on phonology, decoding, and oral reading; they have not recognized the importance of vocabulary instruction for ELLs. Teachers did not differentiate ELLs from students with LD; thus, did not know the instruction ELLs needed (Gersten et al., 2007). These findings demonstrated that teachers need training for instruction of academic vocabulary that takes into account the academic needs of ELLs (Gersten, Baker, & Marks, 1998; Gersten, Baker, Shanahan, et al., 2007).

Effective instruction that is generally used for academic vocabulary included meaningful activities: providing student-friendly definitions that explain words' meanings in diverse contexts (e.g., using visuals or stories), providing frequent

opportunities to use the words being taught, questioning, and corrective feedback. Those activities were delivered using direct instruction (August et al., 2005; Beck et al., 2002; Carlo et al., 2004). Although the effectiveness of this approach on ELLs' vocabulary was demonstrated in many studies, it is uncertain whether it would be effective with ELLs who have learning difficulties as well. Gersten et al. (2007) supported this hypothesis, indicating that teachers should provide differentiated instruction to suit students' different academic levels. They suggested small-group instruction and the extension of instruction time as differentiated instruction for students who need intensive instruction. However, its use in schools has limitations because of the rigid school schedule and teachers' limited time.

This study hypothesized that self-regulation would have the effect of increasing the intensity rather than increasing the length of instruction, based on the successful results of the studies with LD students (Gajria et al., 2007). Previous studies also supported the potential for self-regulation to improve academic achievement, indicating that students increased attention span and task-involvement through its use (Harris et al., 2005; Konrad et al., 2007).

While it is clear that self-regulation was critical in enhancing the academic performance of LD students (Konrad et al., 2007), its use with respect to ELLs has rarely received attention (Konrad et al., 2007; LeClair, Doll, Osborn, & Jones, 2009). Also, while there are numerous studies that investigated the significance of direct instruction for ELLs (Gersten et al., 1998; Gersten et al., 2007), there are few studies about the

development of strategies for ELLs needing intensive intervention (e.g., direct instruction combined with another strategy) (Chamot & O'Malley, 1994; Rodriguez et al., 2009).

Statement of Purpose

Therefore, the purpose of this study is to investigate the effects of self-regulation on the acquisition of science vocabulary of third-grade ELLs with learning difficulties. The following research questions guided this study:

1. What is the effect of self-regulation on the acquisition of science vocabulary of third-grade, Spanish-speaking ELLs with learning difficulties assigned to a bilingual program?
   (a) What is the effect of self-regulation on the acquisition of receptive word definitions of ELLs with learning difficulties?
   (b) What is the effect of self-regulation on the acquisition of expressive oral word definitions of ELLs with learning difficulties?
2. What are the perceptions of third-grade ELLs with learning difficulties concerning self-regulation in learning vocabulary?

CHAPTER 2: LITERATURE REVIEW

This chapter presents four types of literature: (a) limited vocabulary knowledge of ELLs; (b) vocabulary instruction for ELLs; (c) vocabulary instruction focusing on academic words; and (d) self-regulation combined with direct vocabulary instruction as a promising strategy for ELLs.

Limited Vocabulary Knowledge of ELLs

The number of school-age (children ages 5-17) ELLs has increased rapidly; the National Center for Education Statistics (NCES) reports that it more than doubled (from 3.8 million to 10.9 million) from 1979 to 2008. However, their academic performance was discouraging then and has remained so. The NAEP results showed that ELLs performed significantly below EO peers in all subject areas, and the low performance has continued since 1992. The national report stated that 70% of fourth-grade ELLs performed below basic on the 2007 NAEP reading assessment and 67% of fourth-grade ELLs performed below basic on the 2009 NAEP science assessment. Research findings indicated limited vocabulary knowledge as one major reason (August et al., 2005; Gersten & Baker, 2000; Silverman & Nines, 2009).

Cronbach (1942) explained the knowledge of a word as a continuum with five stages. The first stage, generation, is the ability to define a word. The second stage, word application, is the ability to select or recognize situations appropriate to a word. The third stage, breadth, is the knowledge of multiple meanings of a word. The fourth stage,

precision, is the ability to apply a term correctly to all situations and to recognize inappropriate use. The final stage is the actual use of a word in thinking and discourse.

Nagy and Scott (2000) also indicated that knowledge of a word exists on a continuum, from defining the word literally through using the word in context (e.g., literal meaning, the word's various connotations, the sorts of syntactic constructions, morphological options, synonyms, and antonyms). The literature indicated that ELLs have lower knowledge than EO students from the beginning stage, which was defining the word literally (August et al., 2005; Gersten et al., 2007).

Nagy and Scott (2000) also categorized vocabulary knowledge into two aspects: breadth (i.e., how many words students know) and depth (i.e., how well they know the words). ELLs performed significantly below EO students in breadth and depth of vocabulary knowledge (August et al., 2005; Gersten et al., 2007). They showed low knowledge even for frequently used words (August et al., 2005).

Vocabulary Instruction for ELLs

Typically-developing EO students usually acquire words incidentally while reading, encountering the words multiple times. However, incidental word acquisition through reading rarely happens to slow or beginning readers who have less vocabulary knowledge (Swanborn & de Glopper, 1999). Likewise, the possibility that ELLs will learn words incidentally while reading is very low. Since they are often unfamiliar with most of the words in reading texts, they may not be able to understand the sentence

contexts (Carlo et al., 2004). Thus, they may need additional formal instruction to increase their vocabulary knowledge.

Across studies on vocabulary instruction, several characteristics of effective vocabulary-development practices for slow or young learners emerge. Beck et al. (2002) introduced methods for vocabulary instruction in the early grades in an elementary school. First, they suggested providing a definition of a word using everyday language (student-friendly words). A dictionary definition for earlier grade students generates an additional challenge to understanding the meanings; thus, a teacher has to explain the word's meaning using words the students already know. They also suggested providing definitions through rich semantic context. The effectiveness of teaching a word in rich context was demonstrated in many studies (August et al., 2005; Carlo et al. 2004; Gersten et al., 2007). In addition, Beck et al (2002) introduced several activities for effective vocabulary teaching: building new information based on prior knowledge, questioning word meanings in context, and creating sentences using the word. Those activities helped students understand the meaning of the word more deeply. August et al. (2005) added other activities for effective word acquisition: discussing, comparing and analyzing the word, and providing multiple exposures to meaningful information about the word. They also emphasized the importance of frequent review, practice, and reinforcement.

The vocabulary practice guide noted that ELLs needed to learn many words (breadth) to close the academic gap between ELLs and EO students (Gersten et al., 2007). ELLs are significantly behind EO students in breadth of vocabulary knowledge

(August et al., 2005; Gersten et al., 2007). Specifically, typically-developing EO students already know at least 5,000 to 7,000 words before kindergarten. This is thousands more words than ELLs or students with LD (Biemiller & Slonim, 2001). Biemiller and Slonim also indicated that this gap grows larger over time. This finding implies that ELLs would never catch up EO students without rich vocabulary instruction in earlier grades, and emphasizes the importance of the breadth of word knowledge.

The most common instructional approach for the development of breadth is teaching a word's definition in context with story readings (embedded instruction). Biemiller and Boote (2006) conducted two studies using embedded instruction. In the first study, they taught word meanings using repeated readings of storybooks and word explanations, then measured students' progress on an oral word-meaning test (e.g., "what does ____ mean in this sentence?"). A total of 112 students from kindergarten to second grade (approximately 50% of whom were ELLs) participated in this study. The test results showed that the students gained an average of 22% of word meanings. In the second study, researchers provided more intensive word instruction. The number of words taught per day was increased (i.e., 8 to 12 word meanings were learned per week) and the learned words were reviewed more frequently (i.e., adding two reviews of each word meaning taught). Students (n=108) showed a gain of 41% on the word-meaning test. This finding showed that teaching the simple definitions of many words was effective in increasing word knowledge in terms of word meanings. Also, the fact that the

students acquired 400 word meanings per year indicated that they have the potential to acquire many words with a simple instructional approach.

Other studies noted that ELLs might need extended vocabulary instruction, because of the gap in the depth of vocabulary knowledge between ELLs and EO students (August et al., 2005; Carlo et al., 2004). Extended instruction is characterized by rich opportunities to discuss and interact with words outside as well as within story readings (Beck et al., 2002; Coyne, McCoach, & Kapp, 2007; Coyne et al., 2009). Coyne et al. (2009) introduced extended vocabulary instruction and included the following components: (a) introducing the word and defining it during a storybook reading, (b) teaching the word using different contexts within and outside the story, (c) providing various examples of the word's usage, and (d) questions and feedback. The results showed that extended instruction was effective in establishing full and refined word knowledge. This finding led to the idea of developing more effective vocabulary instruction.

In summary, an effective vocabulary instruction has the following features: (a) providing a student-friendly definition of a word, (b) providing exposure to the word multiple times in diverse contexts (e.g., stories and pictures), (c) providing frequent opportunities to use the word, and (d) repeated practice and feedback. These findings suggest using direct instruction to deliver those activities effectively.

Vocabulary Instruction Focusing on Academic Words

Challenges in Learning Academic Words

The current study examined vocabulary instruction that focused on academic words in content areas. Stevens et al. (2000) classified vocabulary into three categories: (a) high-frequency general words, (b) non-specialized academic words, and (c) specialized content-area words. The words used in class could be aligned with the non-specialized or specialized academic words. Non-specialized academic words are the words used in multiple content areas (Scarcella & Zimmerman, 1998). For example, in the sentence "What do the stars on the American flag represent?", *represent* is a non-specialized word. Specialized academic words are the words unique to a content area (Scarcella & Zimmerman, 1998). The words *system, gravity*, and *orbit* in the third-grade science textbook are the specialized academic words (Stevens et al., 2000). Scarcella and Zimmerman (1998) revealed that ELLs had lower knowledge of words in all three categories when compared to the EO students, especially in the two categories (non-specialized and specialized words), as compared to high-frequency words.

Research indicated that it is challenging for ELLs to learn words in content areas such as science and social studies (Gersten & Baker, 2000; Gersten et al., 2007) because textbooks in these content areas include a large proportion of specialized words. The current study targets science, since there is less research in science than in history or social studies (Ciechanowski, 2009; Lee et al., 2008). Ciechanowski (2009) analyzed the third-grade science textbook to examine language usage. Four types of language were

found: (a) causal relationships, (b) relationships of taxonomy, (c) precision and objectivity, and (d) nominalizations. Ciechanowski also indicated that the words in science are objective, precise, and information-oriented; thus, learning them would be challenging for ELLs who lack sufficient background knowledge. Most words in the science text were of the noun type (Ciechanowski, 2009; Lee et al., 2008; Scruggs, Mastropieri, & Okolo, 2008). A nominalized term usually has much information, but it is presented as part of the content and often does not describe the meaning. If students do not know the word meaning, they cannot understand the whole content. This happens frequently to ELLs who have limited academic word knowledge (Gersten & Baker, 2000; Gersten et al., 2007). Therefore, learning academic words is important to ELLs despite the fact that it is challenging to them (Bailey et al., 2004; Gersen et al., 2007; Lee, 2005).

Need for Intensive Instruction

Vocabulary instruction needs to be more intensive if the goal is acquisition of academic words and it is to target ELLs. Gersten et al. (2007) advocated for such intensive instruction. Across studies, several ideas for the development of intensive instruction were suggested. For example, Gersten et al. (2007) introduced additional small-group instruction, cooperative instruction, or long-term intervention to make up intensive instruction for ELLs. However, its practical use is limited. Students have to miss classes in other subjects if they are pulled out for the additional instruction. The additional work may be a burden to teachers. August et al. (2005) introduced instructional strategies such as semantic maps and multimedia support for the effective

vocabulary instruction of ELLs. However, those strategies need additional time and physical effort (August et al., 2005).

Thus, a strategy is needed that can be combined with existing instruction and can facilitate the effect of the existing instruction at the same time. Self-regulation may be an appropriate strategy that meets both conditions, based on the successful effects on the academic skills of students with LD (Konrad et al., 2007). Also, self-regulation combined with direct instruction yielded higher effects than either direct instruction or self-regulation alone; self-regulation was often used with direct instruction for an academic purpose (Konrad et al., 2007).

Self-Regulation

Effects of Self-Regulation on Academic Performance

Self-regulation is defined as monitoring, assessing, and modifying self-behaviors in general (Field et al., 1998; Hallan & Sapona, 1983; Harris et al., 2005; Sawyer et al., 1992). Self-regulation has been applied mainly to classroom instruction (Harris et al., 2005). A research synthesis of self-regulation found that self-regulation instruction was influential in increasing task-involvement and academic performance of students with LD (Konrad et al., 2007).

In the implementation of self-regulation interventions, the sub-components of self-regulation vary depending on the study. For example, Sawyer et al. (1992) developed a self-regulation strategy incorporating self-instruction, self-goal setting, self-assessment, and self-recording to improve the writing skills of students with LD. Maag, Rurtherford

and DiGangi (1992) developed a strategy combining three components — self-observation, self-recording, and contingent reinforcement — to increase academic productivity in math for students with LD. These studies found that the impact of a multi-component self-regulation intervention (e.g., a strategy incorporating self-observation and self-recording; a strategy incorporating self-goal setting, self-assessment, and self-recording) was greater on academic performance than single-component self-regulation interventions. Positive effects of multi-component self-regulation on academic skills were also found in a synthesis of self-regulation (Konrad et al., 2007). Lee, Palmer, and Wehmeyer (2009) noted that the combination of self-goal setting and self-monitoring would be promising to improve academic skills.

Self-Goal Setting and Self-Monitoring

Self-goal setting. Self-goal setting refers to what students try to accomplish (Schunk & Ertmer, 2000). The use of self-goal setting in class increases students' self-efficacy and engagement on-task (Bandura, 1998; Schunk, 1990). Bandura indicated that, in self-goal setting, students seem to compare their goals with their actual performance; thus, they not only put forth an effort to reach the goals but also increase self-efficacy if they could achieve the goals. Although the students may not achieve the goal, they could focus on work, and adjust the goals with the teacher's encouragement.

Lee et al (2009) revealed that students' academic self-goal setting helped them improve academic skills, such as reading comprehension, vocabulary, spelling, and note-taking. The researchers suggested that teachers and students set goals in cooperation at

the beginning. Teachers should train students to determine their goals individually over time.

Fuchs, Bahr, and Rieth (1989) also noted the importance of self-goal in increasing academic performance in a study that compared the effects of a self-selected goal with that of an assigned goal during computer-assisted math computation instruction. The results showed that students in the self-selected goals condition outperformed students in the assigned-goals condition on math computation. The researchers assumed a couple of reasons for the results: (a) students may become more engaged in their work when they have the responsibility of a goal, and (b) students may enhance their potential with higher self-efficacy. The research also emphasized the self-selected goal was more helpful than assigned-goals, especially for students with LD.

Self-monitoring. Researchers define self-monitoring differently depending on the varying combination of components of self-regulation, such as self-observation, self-recording, self-assessment, and self-reinforcement. Shapiro, Durnan, Post, and Levinson (2002) introduced two types of self-monitoring: self-monitoring of performance and self-monitoring of attention. Self-monitoring of performance is usually defined as assessing and recording academic performance (Harris et al., 1994). For example, in math, counting the number of problems attempted or problems completed correctly could be performance monitoring (Harris et al., 1994). Self-monitoring of attention is when students assess and record their on-task behaviors by, e.g., asking oneself, "Was I paying attention?" (Hallahan & Sapona, 1983). Lastly, self-monitoring of strategy was used to

improve the comprehension abilities of expository texts in content areas (Gersten et al., 2001). The self-monitoring of strategy increases the positive effects of the main strategy by combining it with self-monitoring.

Harris and colleague conducted several studies to examine the effect of attention and performance monitoring on the academic performance and behavior of low achievers (Harris, 1986; Harris et al., 1994; Reid & Harris, 1989, 1993). Results were mixed, so it was difficult to determine which of the two interventions was more beneficial to students' academic performance. The effects of both interventions — attention-monitoring and performance-monitoring — on on-task behaviors were not significantly different. However, on improving academic productivity and accuracy, performance monitoring was favored with higher achievement than attention monitoring. But the difference was not significant, and those results were inconsistent among students (Harris, 1986; Reid & Harris, 1993).

Harris et al. (1994) also compared the impact of two self-monitoring interventions on on-task behaviors and academic performance of students with LD. They replicated previous studies, employing the same interventions but varying the dependent variables. They conducted two experiments. In the first, they examined the impact of attention-monitoring and performance-monitoring on the number of words spelled correctly. Students increased their ability to spell words accurately in both conditions. Two of four students showed higher performance under the performance monitoring than attention monitoring. In the second experiment, researchers examined the impacts of two self-

monitoring strategies on story writing (i.e., number of words written and quality of writing) of students with learning disabilities. The results reported that both interventions helped students improve story-writing skills. Those results also revealed that the two approaches did not produce significantly different impacts on academic behaviors and performance. With these findings, it is assumed that self-monitoring of performance is favored to enhance both academic performance and academic behaviors. Nevertheless, inconsistent results in the studies require further research.

Maag, Reid and DiGangi (1993) examined the different effects of three types of self-monitoring (self-monitoring on-task behavior, self-monitoring of academic productivity, and self-monitoring of academic accuracy) on math tasks of students with LD. All showed improved performance in either arithmetic productivity (i.e., number of problems completed), accuracy (percentage of problems completed correctly), or on-task behaviors (percentage of on-task behavior). All three conditions showed similar effects on on-task behaviors. However, self-monitoring of academic productivity and self-monitoring of academic accuracy were more helpful than self-monitoring of attention in improving the performance in academic productivity and accuracy.

Maag et al. (1992) examined the impact of self-monitoring and contingent reinforcement on on-task behavior and academic productivity in math for students with LD. In this study, self-monitoring was divided into two parts: self-observation and self-recording. Contingent reinforcement was defined in terms of the complexity: verbal praise or self-goal setting plus verbal praise. This study investigated the impacts of each

component and multi-component strategies on the academic productivity of students with LD. The results showed that multi-component strategies (e.g., self-observation and self-recording; and self-observation, self-recording, and contingent reinforcement) were more influential on math productivity as compared to the self-observation only strategy.

Self-Regulation in Conjunction with Direct Instruction

Of particular interest in self-regulation research is the effective delivery of self-regulation for students. The self-regulation strategy is often incorporated into a teaching model. This model might be a teaching routine, or evidence-based instruction using some strategy. For example, Sawyer et al. (1992) investigated the impacts of varied self-regulated strategies on the writing of students with LD. Four conditions were provided (i.e., self-regulated strategy development (SRSD) in conjunction with direct writing instruction, SRSD in conjunction with direct writing instruction but without explicit self-regulation, direct writing instruction, and the control group). Full SRSD was to incorporate self-instruction, self-goal setting, self-assessment, and self-recording. Those strategies were taught explicitly; the self-regulation treatment was used in conjunction with direct writing instruction. The second group was provided SRSD but explicit instruction of goal setting, self-assessment, and self-recording were removed. The third group was provided direct writing instruction only. Teachers provided story grammar strategy through direct instruction but removed all self-regulation components. The fourth group was the control group. The mean scores on grammar and writing quality showed evidence that full SRSD (i.e., explicit self-regulated strategy) was most

influential in enhancing writing performance. The students' outcomes in full SRSD were higher on generalization measure and maintenance of writing than on post-test. It proved that it was important to employ SRSD explicitly. Another important finding was that adding self-regulation to direct instruction is more effective when used with another strategy than it was with direct instruction only. Harris et al. (1994) also recommended delivering self-regulation with a teaching model.

Also, Graves (1986) compared the effects of direct instruction, direct instruction plus self-monitoring, and a control group on finding main idea. For the self-monitoring strategy, students were taught to ask themselves whether or not they understood the story using a check mark. The findings indicated that direct instruction plus the self-monitoring strategy was more effective than a direct instruction-only strategy.

Moreover, Jitendra and colleagues (1998) investigated the effects of a main idea strategy delivered using the direct instruction approach and a self-monitoring strategy on the reading comprehension of students with LD. For the main idea strategy, students were taught to identify key ideas from passages, ranging in skill level from easy to difficult. Also, students were taught to monitor their use of the summarization strategy with the prompt card for checking the steps of the strategy. Study results indicated that the summarization strategy increased reading comprehension skills, and the summarization with self-monitoring strategy yielded additional effects. However, the effects of self-monitoring were not maintained over time without additional reinforcement.

Self-Regulation for ELLs

The literature on self-regulation has reported that a self-regulation strategy was successful in enhancing academic outcomes of low achievement students (Harris et al., 2005; Harris & Graham, 1992; Reid, 1996). However, most studies of self-regulation have focused on students with LD who speak English (Konrad, et al., 2007).

Some researchers (Graham & Harris, 1989; Harris et al., 2005) have proposed that self-regulation could be useful for other populations. For example, Chamot and O'Malley (1996) have indicated that self-regulation was beneficial to ELLs. They introduced CALLA, which includes meta-cognitive strategies such as self-monitoring and self-assessment as primary instructional components. After using CALLA, ELLs' academic performance in content areas improved.

Researchers have also mentioned the importance of self-regulation for ELLs, because of their low self-efficacy and passive attitude in class in spite of their potential (Rodriguez et al., 2009). With high self-efficacy, ELLs could increase their test scores and show their real potential (Rodriguez et al., 2009). Also, when ELLs involve themselves in class with an active attitude, they improved academic performance (Gersten & Baker, 2003; Konrad et al., 2007).

In summary, ELLs are significantly behind EO students in breadth and depth of vocabulary knowledge. The achievement gap between the two groups is greater in specialized academic words than in high-frequency words because of the specialized words' unique characteristics. Many effective interventions have been introduced for

ELLs' vocabulary acquisition by analyzing the characteristics of their language development. Still, for difficult tasks such as acquiring science words, especially for ELLs with learning difficulties, more intensive instruction beyond widely used interventions is required. Self-regulation in conjunction with direct vocabulary instruction may be a promising strategy for the ELLs with learning difficulties.

CHAPTER 3: METHOD

The purpose of this study was to investigate the effects of self-regulation on the acquisition of science vocabulary of third grade ELLs with learning difficulties. This study employed a multiple probe design across subjects and it consisted of four phases: (a) baseline, (b) self-regulation training (training), (c) self-regulation (intervention), and (d) maintenance. Participants were provided direct vocabulary instruction during the baseline phase. Self-regulation with prompts was added to the direct instruction in the training phase and, during the intervention phase, prompts were removed. The intervention continued until the maintenance phase. At the end of each session, vocabulary tests were administered to measure the participants' acquisition of vocabulary.

Research Questions

The following research questions guided this study:

1. What is the effect of self-regulation on the acquisition of science vocabulary of third-grade, Spanish-speaking ELLs with learning difficulties assigned to a bilingual program?
   (a) What is the effect of self-regulation on the acquisition of receptive word definitions of ELLs with learning difficulties?
   (b) What is the effect of self-regulation on the acquisition of expressive oral word definitions of ELLs with learning difficulties?

2. What are the perceptions of third-grade ELLs with learning difficulties concerning self-regulation in learning vocabulary?

Participants

School

The study was implemented in an elementary school in Central Texas. The school had 617 students and received Title I support; more than half of the students came from low-income families. Detailed demographic information on the district and school was collected (see Table 3.1).

Table 3.1

District and School Demographic Information

	District	School
African American	9.5% (n=8,145)	3.2% (n=20)
Asian	3.3% (n=2,829)	3.9% (n=24)
Hispanic	59.7% (n=51,185)	90.8% (n=560)
White	24.6% (n=21,091)	2.1% (n=13)
Other	2.9% (n=2,486)	0.0% (n=0)
Total	100% (n=85,736)	100% (n=617)
Economically Disadvantaged	63.6%	94.2%
English Language Learners	28.6%	52.4%
At-Risk		65.0%

Participant Selection Criteria

Participants were four third-grade Spanish-speaking ELLs with learning difficulties. The participants met six criteria. First, participants were identified as ELLs by the school district based on a home language survey and scores on the Texas Education Agency (TEA) approved oral-language proficiency test (Pre-Language Assessment Scales [Pre-LAS]). If a student's home language was a language other than English and his or her score on the Pre-LAS was level 1, he or she was classified as an ELL. Second, among those students, ELLs who were at the beginning stage of English language development according to the Texas English Language Proficiency Assessment System (TELPAS) were eligible. Third, participants' primary language was Spanish. Fourth, the participants were identified as academically at risk based on district criteria because they scored below the benchmark (60%) on the *Middle of Year District Exam* on the Benchmark Assessments administered in December 2010. Fifth, participants scored at least one standard deviation below (or below grade level) on the Peabody Picture Vocabulary Test–Third Edition (PPVT–III; Dunn & Dunn, 1997). Sixth, participants scored between 20 and 25% accuracy on the researcher-developed vocabulary knowledge test.

Participant Selection Procedure

The researcher used the following procedures to select participants for this study. First, the bilingual classroom teacher was asked to recommend students who might meet

the above criteria at the beginning of the spring semester (January 5, 2011). Six students returned consent and assent forms. They were administered the researcher-developed vocabulary knowledge test on January 18, 2011. One of them scored above 25% accuracy on the test, and was excluded as per the selection criteria. Then, the remaining five students were administered PPVT-III on January 20 and 21, 2011, and all of them met the criterion. Therefore, the five students were selected as participants. One student was in a car accident during the experiment and withdrew. Four students (Erica, Christine, Andrew, and Brian) participated in the study. Pseudo names were used for students' privacy in this study. More detailed information on each participant follows.

Participants

Erica. Erica was an 8-year old girl from a single parent home. Her parent immigrated to the US from Mexico. Her home language was Spanish and she ranked level 1 on the Pre-LAS. Thus, she was identified as ELL and placed in a bilingual classroom. Also, her scale score on the TELPAS Reading Assessment was 589, which is the beginning level among four distinct levels of learning English—beginning, intermediate, advanced, and advanced high. She was from an economically disadvantaged home and participated in the free lunch program. Her scores, 55% in reading and 35% in math, on the *Middle of Year District* Exam in Benchmark Assessments in December 2010 placed her below the benchmark (60%) and in the at risk category. Additionally, she performed in the bottom 25% in overall academic areas including reading, math, and content areas, based on classroom teacher observation. She

did not receive special education or speech therapy, but received small group math instruction for 40 minutes every day. On the PPVT-III test, she ranked at the 0.4 percentile with a standard score of 60, falling in the extremely low achievement range. Her normal curve equivalent was below one; the stanine was one. Her age equivalent for her raw score of 61 was 4-9 (4 years 9 months), which was four years younger than her chronological age. She also scored 10 points out of a total 41 (24%) on the researcher-developed measure on science word meaning.

Christine. Christine was a 9-year old girl who lived with her married parents who immigrated to the US from Mexico. Her home language was Spanish and she ranked level 1 on the Pre-LAS. Thus, she was identified as ELL and placed in a bilingual classroom. Her scale score on the TELPAS Reading Assessment was 551, which placed her at beginning level. She was from an economically disadvantaged home and participated in the free lunch program. She was identified academically at risk based on the district criteria; she scored 44% in reading and 35% in math on the *Middle of Year District Exam* in Benchmark Assessments in December 2010, which was below the benchmark (60%). Additionally, she performed in the bottom 25% in overall academic areas including reading, math, and content areas, based on classroom teacher observation. She did not receive special education or speech therapy, but received small group math instruction for 40 minutes every day. On the PPVT-III test, she ranked at the 2.0 percentile with a standard score of 69, falling in the extremely low achievement range. Her normal curve equivalent was six; the stanine was one. Her age equivalent for her raw

score of 78 was 5-11 (5 years 11 months), which was four years younger than her chronological age. She also scored 7 (17%) on a 41-point scale on the researcher-developed measure on science word meaning.

Andrew. Andrew was an 8-year old boy from a single parent, economically disadvantaged home. His parent immigrated to the US from Mexico. His home language was Spanish and he ranked level 1 on the Pre-LAS. Thus, he was identified as ELL and placed in a bilingual classroom. Also, his scale score on the TELPAS Reading Assessment was 563, which is in the beginning level. He was identified academically at risk based on the district criteria. Also, he scored 44.4% in reading and 37.5% in math on the *Middle of Year District Exam* in Benchmark Assessments in December 2010, which was below the benchmark (60%). Additionally, he performed around the bottom 25% in overall academic areas including reading, math, and content areas, based on classroom teacher observation. He did not receive special education or speech therapy, but received small group math instruction for 40 minutes twice a week. On the PPVT-III test, he ranked at the 5.0 percentile with a standard score of 75, falling in the moderately low score range. His normal curve equivalent was 15; the stanine was two. His age equivalent for his raw score of 80 was 6-01 (6 years 1 month), which was two years younger than his chronological age. He also scored nine points out of a total 41 (22%) on the researcher-developed measure on science word meaning.

Brian. Brian was a 9-year old boy from a single parent. His parent immigrated to the US from Mexico. His home language was Spanish and he ranked level 1 on the Pre-

LAS. Thus, he was identified as ELL and placed in a bilingual classroom. Also, his scale score on the TELPAS Reading Assessment was 537, which is in the beginning level. He was from an economically disadvantaged home and participated in the free lunch program. He was not only identified academically at risk based on the district criteria, but also identified as dyslexic based on a district dyslexia test and observation. Also, he scored 66.7% in reading and 42.5% in math on the *Middle of Year District Exam* in Benchmark Assessments in December 2010, which was below the benchmark (60%). Additionally, he performed around the bottom 25% in overall academic areas including reading, math, and content areas, based on classroom teacher observation. He did not receive special education or speech therapy, but received small group math instruction for 40 minutes twice a week. On the PPVT-III test, he ranked at the 4.0 percentile with a standard score of 74, falling in the moderately low score range. His normal curve equivalent was 13; the stanine was two. His age equivalent for his raw score of 85 was 6-05 (6 years 5 months), which was three years younger than his chronological age. He also scored 10 points out of a total 41 (24%) on the researcher-developed measure on science word meaning.

Design

A multiple probe across subjects design was employed to assess the effects of self-regulation on the word definition acquisition of ELLs with learning difficulties. The purpose of this design was to verify a functional relationship between the intervention and subject's progress through the replication of effects across subjects. The main

features of the multiple probe across subjects design are that a researcher does not collect baseline data continually and an intervention is sequentially introduced to each subject after stable performance has been established (Horner & Baer, 1978).

This study consisted of four phases: (a) baseline, (b) training, (c) intervention, and (d) maintenance. The researcher taught and tested six target words during each session of the four phases. One to three baseline probes were administered prior to the introduction of intervention. During the baseline phase, vocabulary instruction using a direct instruction routine was implemented. The intervention was introduced to each of the four students at different points in time. The student with the most stable performance and decreasing trend during the baseline phase was selected as the first student for intervention. Prior to the intervention phase, the student received two training sessions during which he was taught how to use self-regulation by the researcher. During the intervention phase, the student used self-regulation without prompts. The intervention sessions continued until the student either attained at least three scores higher than the highest score at baseline and showed an increasing trend, or improved performance with stability. All students received at least four sessions during the intervention phase.

Maintenance probes were conducted when the student demonstrated clear progress in the test scores during the intervention phase. At least two weeks after the last intervention session, a maintenance probe started, and each session during the maintenance phase was conducted at approximately two-week intervals. If the student performed lower than baseline, another probe was employed two to three days later. The

number of maintenance probes was limited because of the limited number of words. This pattern was replicated across students.

When the first student received a baseline probe prior to the introduction of the intervention, the other students also received the baseline probe to document student performance without intervention. Moreover, when the first student received an initial intervention session, the other students were administered a baseline probes to verify the effect of the intervention. Once the first student demonstrated progress in the intervention phase, baseline probes were conducted for the second student until stable performance was established. Still, no additional probes were conducted on student 3 and 4. After two sessions of training, the intervention session was provided to the second student while students 3 and 4 received a baseline probe at that point.

The multiple probe design was efficient to use, as it did not require continuous data collection. This study provided direct instruction as standard instruction during the baseline phase, in contrast to other studies where no instruction was provided in baseline. Therefore, it prevented an impact on scores by not increasing the amount of time allotted to instruction.

Measures

This study used five measures to determine participant eligibility and two measures as the dependent variable. The measures for participant selection consisted of three language measures: the district academic test (Benchmark Assessment) and two vocabulary measures (PPVT-III and a vocabulary knowledge test). This study used the

results on the Pre-LAS and TELPAS administered by the school district test administrators to identify the language proficiency of the participants. Scores on the benchmark test were used to acquire more specific information about students' academic performance in reading. Additionally, this study administered the PPVT-III and the vocabulary knowledge test to identify students' current vocabulary knowledge.

The dependent variable was acquisition of word definition. The students were assessed on receptive and expressive vocabulary definition tests at the end of every session. Furthermore, student interviews were conducted after completion of the study. More detail information about the measures is described below.

Measures for Participant Selection

Pre-Language Assessment Scales 2000 (Pre-LAS 2000: Duncan & DeAvila, 1998). Pre-LAS 2000 measures the English and Spanish language proficiency and pre-literacy skills of children aged 4 to 6 years. Pre-LAS 2000 includes oral assessment (oral language proficiency test) and pre-literacy assessment. It is an individual test and allows 10-15 minutes for the oral test and 5 minutes for the pre-literacy test. This test measures language proficiency with receptive language and expressive language tasks. The test consists of five subtests; the first four include 10 items each, and the fifth subtest is to tell orally about presented stories. The proficiency scores range from level 1 to level 5. Level 1 corresponds to a non-English speaker; level 2 and 3 correspond to a limited English speaker; level 4 and 5 correspond to a proficient English speaker.

Pre-LAS 2000 is a norm-referenced standardized test. Reliability values at the subtest level range from .85 to .91. The technical manual does not provide internal consistency reliability at the overall test level. The test-retest coefficients for subtests are also adequate (most in the .90 range). Regarding test validity, the manual only reports criterion-related validity for the comparison of alternate forms of the pre-LAS 2000 subtests. The findings show strong consistency across both versions. The test also provides an analysis of how well the test correctly classified diverse academic levels of children. The total test scores and proficiency levels are found to clearly distinguish English-only children from those whose first language was not English.

Texas English Language Proficiency Assessment System (TELPAS). TELPAS is an assessment program designed to measure the English acquisition in four language domains—listening, speaking, reading, and writing—of K-12 students who are identified as limited English proficient.

TELPAS reading assessments for grades 2-12 are multiple-choice tests administered online. The TELPAS reading test (English Language Proficiency and Language Arts) is designed to assess what ELLs can read accurately and comprehend at four distinct stages of learning English—beginning, intermediate, advanced, and advanced high (see Table 3.2). These stages, that are referred to as proficiency levels, are defined in four sets of proficiency level descriptors (see Table 3.3). TELPAS results are used as federal Annual Measurable Achievement Objective indicators to hold districts

accountable for increasing the rate at which ELLs become proficient in the English language.

Table 3.2

Raw Score Cut Points and Scale Score Ranges

TELPAS Reading Assessment	Total Number of Questions on Test	Scale Score Ranges			
		Beginning Level	Intermediate Level	Advanced Level	Advanced High Level
Grade 3	58	0-596	597-647	648-698	699+

Table 3.3

Staged Linguistic Accommodation Test Design

TELPAS Reading Levels	Instruction Needs	Definitions of the Proficiency Levels
Beginning	Extensive	Little or no English ability
Intermediate	Substantial	Limited ability, simple language structures, high-frequency vocabulary, routine contexts
Advanced	Moderate	Ability to engage in grade-appropriate academic instruction with second language acquisition support
Advanced High	Minimal	Ability to engage in grade-appropriate academic instruction with minimal second language acquisition support

District academic test: Benchmark assessment. School districts assess student performance across subjects and collect performance data throughout the instructional year to observe academic progresses. Benchmark Assessments are standard-based assessments administered to students three times per year (beginning-of-year, middle-of-year, and end-of-year). Results of the Benchmark Assessments are used to determine student growth and performance as compared to state and federal guidelines for student achievement. These assessments are designed as an instructional improvement tool, not an evaluative tool.

Students in grades 2-11 participated in the benchmark assessment process in the 2010-11 school year. Students were assessed at the beginning of school year to provide diagnostic information for instruction. Students were assessed in December 2010 to provide data about student progress on all TAKS skills. Students will be assessed at the end of the year to provide summative mastery and comparative information only in the subjects where no TAKS test is administered.

Peabody Picture Vocabulary Test-Third Edition (PPVT; Dunn & Dunn, 1999). This study used PPVT-III to select participants by measuring their vocabulary knowledge. PPVT-III is a norm-referenced standardized instrument designed to measure the students' ability to comprehend vocabulary meaning. It is a multiple-choice test that requires the students to identify which of four numbered pictures best identifies the word,. The tester states a word describing one of the pictures, and asks a student to point to or say the number of the correct picture. The test was administered verbally and took about 11 to 12 minutes; it was developed to measure the vocabulary of students in kindergarten to grade 12. The total score was converted to a percentile rank, age/grade, or a standard deviation IQ score.

Internal consistency reliability of the PPVT-III ranges from .92 to .98, with a median of .95, and split-half ranges from .86 to .97, with a median of .94. It has an average correlation of .69 with the Oral and Written Language Scales (OWLS) Listening Comprehension scale and .74 with the OWLS Oral Expression scale. Its correlations with

measures of verbal ability are: .91 (Wechsler Intelligence Scale for Children, 3rd ed. (WISC-III VIQ)), .81 (Kaufman Brief Intelligence Test (K-BIT Vocabulary)).

Vocabulary knowledge test. The vocabulary knowledge test was administered to measure students' knowledge of science words. This test was developed by the researcher and was used as a screening measure. It was a word-definition matching test. The test consisted of 41 questions encompassing three science topics (life science, Earth science, and human body). The words and definitions used in the questions were randomly selected from a list of the target words. This test provided paired lists of words and definitions and required students to correctly match the word with its definition (Appendix B). To establish the content validity of the test, the review group examined the questions and ensured that those questions were appropriate to accurately measure students' vocabulary knowledge.

Dependent Measures

Students received a vocabulary lesson on six target words every session. A vocabulary-definition matching test (receptive definitions) and an oral vocabulary test (expressive definitions) were administered after the lesson for 4-5 minutes for each student to measure the student's knowledge on the six target words. These were researcher-developed individually administered measures. The researcher administered those tests using a script.

Receptive definitions test: Vocabulary-definition matching test. The receptive definitions test was used to measure students' achievement in recognizing definitions of

the words. The test format required students to match target words with their definitions from paired lists of words and definitions (see Appendix C). The six definitions of the target words were printed on the left, and eight words, six target words and two distracters, were printed on the right. The distracters were included to prevent students from using the process of eliminating when choosing answers. A tester first read each definition, then asked a student to connect the definition to the word matched. For example, the tester said, "Question number 1, a group of parts that work together… draw a line to the correct answer" and waited for the student to draw a line between the definition read and a word. The tester read each question twice. Then, the tester moved to the next question. The student received 1 point for each correct answer and 0 points for each incorrect answer. It was 7-point scale (i.e., from 0 points to 6 points) per session.

Vocabulary-definition matching is one approach to assessing the identification of identifying word meanings (Read, 2000). This test format was found to be valid and reliable in measuring students' vocabulary knowledge in social studies (Espin, Shin, & Busch, 2005).

Expressive definitions test: Oral vocabulary test. The expressive definitions test was developed to measure students' ability to recall word definitions. The test was based on the expressive definitions measure employed in a vocabulary intervention study by Coyne and his colleagues (2007). The expressive definitions test required students to define the target word verbally. The tester read the target word and asked a student to recall its meaning. For example, for the word *prevent*, the teacher asked the student the

question, “What does the word *prevent* mean?” The tester wrote the student’s answer. Then, the tester asked the following question, “Can you tell me anything about the word *prevent*?” The tester wrote the student’s answers. The student’s answer for each target word was scored from 0 to 3 points. Scoring was based on the following criteria: (a) 0 points for unrelated response or no response, (b) 1 point for minimal partial knowledge, (c) 2 points for incomplete response which displayed substantial partial knowledge, and (d) 3 points for totally correct answer (Nagy, Herman, & Anderson, 1985). More specifically, students were given a score of 1, minimal partial knowledge, if they provided only one key word in the definition. Students who provided two or more key words in case of short meaning, gave an example which displayed substantial knowledge, or explained the meaning but incompletely were give an score of 2, substantial partial knowledge. Since the participants were ELLs, grammar errors and synonyms were allowed. For example, for the word *prevent*, 3 points were given to the response “when you want to stop something before”, 2 points were given to the response “do not getting sick”, 1 point was given to the response “stop” or “before”, and 0 points were given to the response “I don’t remember.” The score range was from 0 to 18 points per session. The answer was scored by inter-scorer agreement.

Inter-scorer agreement. Inter-scorer reliability of students’ answers was collected during entire testing probes. Two people independently scored students’ responses to the receptive definitions test and the expressive definitions test. The first scorer was the researcher, and the second was a graduate student majoring in chemical engineering. For

the scoring reliability of the receptive definitions test, two scorers scored students' responses independently with the answer keys of each test. The percentage of agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Inter-scorer agreement on the receptive definitions test was 100% for all participants. Second, for the scoring agreement of the expressive definitions test, two scorers scored students' responses independently following the scoring criteria. Reliability was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Percentage agreement for the expressive definitions measure across students was 91.8%. Inter-scorer agreement values for the four students were 92.3%, 100%, 93.3%, and 82.4%, each.

Student Interviews

At the end of data collection, students were individually interviewed regarding their perceptions on utility of the intervention, their preference, and recommendation. The researcher developed an interview questionnaire by referring to the interview questions used by Harris et al. (2005). The interview consisted of five questions that inquired about the teaching routine and five questions about self-regulation. The students were asked the following questions about the teaching routine: "What was the easiest part and what was the most difficult part in class?" "What things did you like most in class; why?" "What things did you not like in class; why?" "What things helped you most understand the meaning of the words; why?" "What things least helped you understand the meaning of

the words; why?" In regard to self-regulation strategy, students were asked the following questions: "I will ask you questions similar to the ones before, but these questions will be about self-regulation" "What things did you like most in using the self-regulation form; why?" "What did you not like in using the self-regulation form; why?" "What things helped you most understand the meaning of the words; why?" "What things were the least helpful in enabling you to understand the meaning of the words; why?" "Imagine you become a teacher. If you are going to choose one of these things to teach your students, which one would you teach; why?"

Materials

This study employed five types of materials: (a) wordlist, (b) word-definition sheet, (c) pictures, (d) self-regulation sheet, and (e) teaching script (see Appendix D). Before beginning the experiment, the researcher developed a wordlist to select the target words. Once selected, the researcher developed definition sheets and collected pictures that describe the meaning of each word. The researcher used the definition sheets and pictures when teaching the target words. The researcher also developed a self-regulation sheet to aid self-regulation strategies; it was used during the training, intervention, and maintenance phases. The lessons were conducted using teaching scripts. A sample lesson script is presented in Appendix D.

Target word selection

This study included 102 target words. The target words were selected using the same procedure used by Espin and colleague (2005) in developing a Curriculum-Based

Measurement-Vocabulary in social studies (CBM-content area). First, science topics for the third grade were identified from Texas Essential Knowledge and Skills for Science. The central topics were (a) matter and energy, (b) force, motion, and energy, (c) Earth and space, and (d) organisms and environment. Then, the words associated with the identified topics were chosen from the science textbook used in the school. The words for the topics that had already been covered were not included to avoid the impact of prior knowledge on results. This was verified with the students' classroom teacher for each topic and each word. Therefore, words were selected from only three units in the textbook (life science, Earth science, and human body). Third, among those words, only academic words were selected. Stevens et al. (2000) divided words into three categories: (a) high-frequency general words (i.e., those used regularly in everyday contexts); (b) non-specialized academic words (those used across content areas); and (c) specialized content-area words. The specialized academic vocabulary consists of the academic words unique to specific content-areas such as *system, gravity*, or *orbit* (Stevens et al., 2000). The academic words in this study were considered non-specialized academic words and specialized content-area words. The researcher developed a wordlist with the selected words. The words were listed under each science topic.

Lastly, a word review group reviewed the words on the wordlist (Figure 3.1) and chose those satisfying three criteria: (a) words at the third-grade level; (b) information-oriented words; and (c) words that are important and useful (i.e., words that appear frequently in the specialized content areas and have a precise meaning). The professional

review group consisted of five members: (a) professor in the special education department, (b) third-grade bilingual teacher, (c) third grade general education teacher, (d) PhD student who had teaching experience in an elementary school, and (e) PhD student who had taught ELLs in an elementary school. The teachers had a teacher credential. They were given the wordlist with the written criteria and examples. One criterion was to decide whether the word was on the third-grade level; this criterion helped identify the equivalence of the words. The other two criteria were included to select necessary words in third-grade science, but that were not too broad or specific. Those that met the criteria and that were agreed upon by at least three members became the target word candidates.

Word List: Make √ mark in the checkbox if you agree the word fit below criteria
If a word was already taught, strike out the word.
If there are words you want to add, write down the words at the end of this sheet

[Word Review to check equivalence and adequacy of the words below to select final target words]					
[Criterion 1] 3rd grade level: 3rd grade appropriate words					
[Criterion 2] Tier 2 word (academic word):please see below					
[Criterion 3] Difficulty Level: H (hard); M (medium); E (easy)					
[Criterion 4] Exclude words that were taught in the Fall semester; ~~Strikethrough~~					

Tier 2 word: ACADEMIC, CONTENT-SPECIFIC WORDS!

- Importance and utility: words that are characteristic of mature language users and appear frequently across a variety of domains.
- Instructional potential: words that can be worked with in a variety of ways so that students can build rich representations of them and of their connections to other words and concepts.
- Conceptual understanding: words for which students understand the general concept but provide precision and specificity in describing the concept. (p 19). Beck et al. (2002)

Words	**3rd grade leve**	**Tier 2**	**Difficulty level**		
e.g.: thermomete	√	√	E		
cumulus	√	√	H		
~~liquid~~	√	√	M		
rot			E		
Unit A: Life Science					
Chapter 1. How plants live and grow					
~~sequence~~	*~~one thing happening after another~~*			Textbook/Easy	
mineral	*a natural, nonliving material that can be found in soil*			*Textbook (ita*	
stem	*the main stalk of a plant that grows up out of the soil*				
carbon dioxide	*a gas in the air that plants use to make food*				
oxygen	a gas found in air and water				
~~petal~~	*~~an outside part of a flower that is often colored~~*				
pollen	*a fine, yellowish powder in a flower*				
pollinate	*to carry pollen to the stemlike part inside a flower*				
seed coat	*the outside covering of a seed*				

Figure 3.1. *Word List Table*

The selected target word were classified into small units along with the topics (e.g., changes in Earth's surface and storms and clouds under the main topic, earth science). Each unit included 10 to 14 words randomly assigned into two lessons; each lesson included six words. A total of 17 lesson scripts including 102 target words were

developed. The decision to teach six words daily was made on the basis of how large the vocabulary load was at the time of year and the current load in the student classroom.

Definition Sheet and Pictures

A definition sheet for each lesson was developed. On the definition sheet, the six *target words* with their definitions were presented; it was mainly used in definition reading and word review activity. The definition of each target word consisted of key terms, a category (or class), and an explanation sometimes with an example. It was not a dictionary definition, but a definition that used the third-grade level vocabulary, also known as a student-friendly definition (Beck et al., 2002). For example, the definition used for *gravity* was *the natural force that pulls everything down toward the Earth*.

Also, the researcher used visual aids such as pictures of the target words to assist the students in understanding the definitions. The researcher explained the meanings of the target words by showing pictures. One or two pictures about each target word were presented on the computer using image files.

Self-Regulation Sheet

The self-regulation sheet consisted of a self-goal setting table and a self-monitoring table (see Figure 3.2). This sheet was developed based on the form used by Sawyer et al. (1992).

Lesson 6 Self-regulation sheet

Name:_____.
Date: _____Week (from _____ to _____)

Goal How many words can I learn today?
6 words
5 words
4 words
3 words
2 words
1 word

Word-master Highlight the words you understand.	Evaluation How many words did I understand?
Atmosphere	6 words
Planet	5 words
Rotate	4 words
Solar	3 words
Surface	2 words
Volcano	1 word

Figure 3.2. *Self-Regulation Sheet*

Self-goal setting. The self-goal setting table was designed to assist students in setting goals at the beginning of the class. The guiding sentence for goal setting, "How many words can I learn today?" was presented at the top of the table and the six options with numbers (i.e., 1 word, 2 words … 6 words) were printed on the table below the sentence.

Self-monitoring. The self-monitoring table was designed to assist students in evaluating their achievement. It consisted of two sections. Students used the first section to assess whether they understood the meaning of each target word (self-assessment). The six target words were printed in that section, and students highlighted the target word when they understood completely. In the other section, six options with numbers (i.e., 1

word, 2 words … 6 words) were printed. The students were asked to circle the number of words that were highlighted (self-recording) so that they could identify how many words they learned. The same table format was used for self-goal setting and self-recording, so the students could compare their goals with the assessment results. The self-monitoring table was used during word-review activity.

Procedures

The experiment consisted of baseline, training, intervention, and maintenance phases. Direct vocabulary instruction was implemented during the baseline phase, and self-regulation in conjunction with direct instruction was implemented during the training and the intervention phases. A total of 17 lessons were developed for this study. Each lesson included six target words followed by daily tests of those six words. One session lasted 30-35 minutes, including 26-30 minutes for lesson, followed by 4-5 minutes for testing. This study was conducted over 15 weeks; all lessons were implemented using a script.

Screening Test

Before starting the experiment, two vocabulary tests (PPVT-III and vocabulary knowledge test) were administered to identify students' initial performance. The results from the tests were used as a part of the participant selection criteria for this study.

Baseline

During the baseline probes, vocabulary instruction was provided using a direct instruction routine. Daily vocabulary tests were administered immediately after the lesson.

Direct instruction routine. The direct instruction routine in this study was based on the explicit and systematic instruction model suggested by Beck et al. (2002). It consisted of five activities: (a) activating prior knowledge of the target word, (b) providing student-friendly definition of the word, (c) explanation of the word meaning in context using examples and pictures, (d) providing activities for word acquisition (questioning and creating a sentence) using a word, and (e) word review. The sequence of the instruction during baseline is outlined in Table 3.4.

Table 3.4

Sequence of Instruction

	Baseline: Direct instruction	Intervention: Self-regulation in conjunction with direct instruction
Before Word Instruction (30 seconds)	Gain attention (No Self-goal setting)	Gain attention with Self-goal setting
During Word Instruction (4 - 5 minutes for each word)	a. Activating prior knowledge of the word b. Providing student-friendly definition c. Learning meaning of the word in context d. Internalizing the meaning using activities a) Identifying the word in sentences b) Sentence-making question using the word	a. Activating prior knowledge of the word b. Providing student-friendly definition c. Learning meaning of the word in context d. Internalizing the meaning using activities a) Identifying the word in sentences b) Sentence-making question using the word
After Word (1 - 2 minutes) Instruction	Word review (No Self-monitoring)	Word review with Self-monitoring

At the beginning of the lesson, the student was shown six target words with the definition sheet. Vocabulary instruction started with sharing prior knowledge of the target word. First, the student read the target word aloud. Then, the researcher asked the student to tell if he or she had ever heard the word before, and to tell what he or she knew about the word. After a quick discussion, of about 30 seconds, the researcher provided the student-friendly definition. The researcher and the student read the definition together; then, the student read the definition alone. It was important to read it phrase by phrase to clarify the meaning. For example, when the student read the definition of *gravity*, he said "*gravity* means" paused, read "*the natural force*", paused, read "*that pulls everything down*", paused, and read "*toward the Earth.*"

Next, the researcher explained the definition of the target word in context by using pictures and examples. The researcher showed six to seven pictures related to the six target words using a laptop screen and asked the student to point to one picture related to the first target word. The picture exemplified the meaning and characteristics of the target word. Sample pictures are presented in Appendix E. The researcher also provided sample sentences that used the target word in a context that might be familiar to the student such as school or home.

After the explanation of the target word, the researcher provided the true/false quizzes and sentence-making activities using the target word. These activities required the student's active participation; thus, it helped the student internalize the meaning of the word. The true/false quizzes determined whether the target word was used correctly in

the given sentence. Question sentences were made of extended definition (true) or definition of another word similar to the target word (false). The student could clarify the meaning of the word through this activity. In the sentence-making activity, the students created sentences using the target word. This activity helped the student use the word in an appropriate context and internalize its meaning. These activities were adjusted depending on the student's response.

Each target word was taught following the steps listed above. At the end of the lesson, the student reviewed the six target words using the definition sheet for about two minutes. It was independent work and the student reviewed the words on his own. The student was allowed to access the instructional materials such as definition sheet and pictures during the review.

Self-Regulation: Training

During the training sessions, direct vocabulary instruction in conjunction with self-regulation was implemented. The vocabulary instruction routine in the training phase was identical to that of the baseline. However, the self-regulation strategies were added to the lesson. Therefore, the lesson now started with goal setting prior to starting vocabulary instruction and self-monitoring took place after all the words had been taught. Time arrangement in the lesson and testing procedure were identical to that of the baseline. Each session lasted 30 - 35 minutes, including 26 - 30 minutes for a lesson and 4 - 5 minutes for tests.

Specific procedures for self-regulation. Self-regulation in this study consisted of self-goal setting and self-monitoring. Figure 3.2 shows the self-regulation sheet.

Self-goal setting. Self-goal setting was used to decide the maximum number of words that a student could learn in a lesson. At the beginning of the lesson, a student established a learning goal. For example, the researcher said, "Today we will study six words: *adaptation, produce... prevent*." Then, the researcher guided the student to make a quantifiable goal: "How many words will you learn today?" The guiding sentence (i.e., "How many words can I learn today?") was also presented on the sheet. The six options (i.e., 1 word, 2 words... 6 words) were printed on the sheet (see Figure 3.2). The student chose one of the numbers. The student had 30 seconds to set a goal while the researcher observed whether the student followed the guideline. In the self-goal setting, it was important for a student to make an achievable goal. It was taught comparing student's goals and actual scores. The student was encouraged to make a higher goal if the original one was too low, such as 1 or 2 words.

Self-monitoring. Self-monitoring consists of self-assessment and self-recording (Harris et al., 2005). Students used self-monitoring to assess whether or not they understood the meanings of target words during the review time. The word *understand* in the guiding sentence "*understand the word*" meant the ability not only to know the meaning of the word but also to explain it with related information and an example. The researcher explained what *understand* meant and practiced it using examples. For example, the researcher asked the student "Do you *understand* the word?" If the student

answered "*yes"*, he was asked to tell the meaning of the word, related information, and examples. If he responded correctly, the researcher let him know that he *understood* the word correctly, showing the definition on the word sheet and related pictures; the student was allowed to highlight the word on the table. If the answer was wrong, the researcher told him that he had not *understood* the word yet. The researcher provided the correct meaning and examples; the student was not allowed to highlight the word on the self-monitoring table. This process was repeated until the student knew how to use it completely. Once the self-assessment was done, they counted the number of highlighted words and circled one of the six options (i.e., 1 word, 2 words, ... 6 words) (self-recording) on the self-monitoring table.

General procedures for training. Two training sessions were conducted; each training session was divided into two parts: self-regulation training and training lesson. First, the students were trained in to use self-regulation strategies. Next, the students used the strategies during the training lesson. The training lesson consisted of the vocabulary lesson, teaching six target words, with the addition of self-regulation strategies with researcher prompts.

The vocabulary lesson in the training phase was provided in the following order: (a) self-goal setting, (b) activating prior knowledge of the target word, (c) providing student-friendly definition of the word, (d) explaining the word meaning using examples and pictures, (e) providing activities using the target word (questioning and creating sentences), and (f) reviewing the word with self-monitoring of performance. Immediately

after the lesson, daily tests were administered. The sequence of the instruction is outlined in Table 3.4.

Before training, the researcher explained the goal of the strategies. The researcher explained that self-goal setting increased self-efficacy because he or she decided on the goal independently. Also, it was explained that the self-monitoring table helps the student study systematically by providing a means for evaluating ones own performance during independent practice.

Then, training was conducted. First, the student learned how to establish a self-goal; he or she was taught to decide the maximum number of words to be learned in that lesson. The training continued until the student could make an achievable goal. Second, the student was taught how to use self-monitoring of performance. Self-monitoring of performance was used to assess whether or not he or she learned (i.e., understanding the meaning of the word), and to record assessment results. Training of self-monitoring continued until the student could assess and record his performance accurately. The training was conducted following these three steps: (a) modeling of the strategy, (b) collaborative practice with corrective feedback, and (c) independent practice. Once the student could implement the self-regulation strategies completely, the researcher trained the student to use self-regulation in the actual lesson.

Self-Regulation: Intervention

After two training sessions, the intervention phase was conducted. During the intervention sessions, the direct vocabulary instruction combined with self-regulation was implemented as it was during the training sessions. The difference between the training session and intervention session was whether self-regulation was implemented with prompts or without prompts. During the intervention phase, the student used self-regulation by himself, without prompts.

Maintenance

To examine delayed effects of the intervention, the vocabulary instruction and testing was conducted at approximately two-week intervals after the intervention phase. Instruction routine and strategies used in the maintenance probes were identical to those used in intervention phase. Tests were also administered immediately after the lesson, just as they were in the baseline probes and the intervention sessions.

Intervention Fidelity

During the study, a research assistant assessed intervention fidelity. This study did not utilize observation, to avoid the students being distracted by the observer; instead, the lessons were audio-recorded. To determine fidelity, the research assistant assessed whether or not the researcher followed the instruction conditions as intended during treatment using the observation checklist. The checklist for treatment fidelity is presented in Appendix F She assessed 43% of the sessions; the fidelity was 100%.

This study also assessed whether students used self-regulation as intended. The checklist is presented in Appendix G. The research assistant assessed the fidelity by checking the self-regulation sheets used by the students. She checked all self-regulation sheets used in study, and the fidelity was 100%.

Analysis

Visual analysis of the data from the daily tests was conducted. Level changes and trends in students' performance were observed within each phase and across the phases (baseline, training, intervention, and maintenance). More specifically students' performance for (a) baseline stability, (b) changes in level (percentage correct), trend, and variability, (c) direction in changes were examined (Horner et al., 2005). For example, this study compared overall percentage scores or levels across phases to find a functional relationship between the independent and dependent variables. Second, the trend or slope of the data was examined with regard to whether the levels are increasing, decreasing, or remaining flat across the phases. Third, the variability of the data or how much the data vary in relation to the overall mean or level was examined within a phase. Moreover, immediacy of effect from the end of one phase and the beginning of another was examined. Overlap of data points was examined as well (Horner et al., 2005).

CHAPTER 4: RESULTS

This study examined the effects of self-regulation on the acquisition of word knowledge of ELLs. Four third-grade ELLs with learning difficulties participated in this study. A multiple probe across subjects design was employed and consisted of four phases: (a) baseline, (b) self-regulation training (training), (c) self-regulation (intervention), and (d) maintenance. During the baseline, direct instruction vocabulary lessons were implemented. Self-regulation was introduced in the training phase. During the training sessions, vocabulary instruction in conjunction with self-regulation was conducted. Prompts were used to help students learn to use self-regulation. During the intervention phase, vocabulary instructional routine in conjunction with self-regulation was implemented, but prompts were discontinued. The intervention continued during the maintenance phase. Six target words were taught; each lesson lasted 26-30 minutes across all phases. Two daily tests (receptive definitions test and expressive definitions test) were administered immediately after the lesson to measure whether students had learned the meaning of the six target words; this took 4-5 minutes.

This study used the point of phase change, following the criteria used by Cuvo (1992). Baseline probes were conducted prior to the introduction of the intervention. Participants who established stable performance received the self-regulation training. After two sessions of training, the intervention phase started. Intervention sessions continued until the participant performed higher than the baseline in at least three sessions and the performance showed an increasing trend, or the enhanced performance

was stable. In this study, the participants received four to five intervention sessions. After intervention, they received maintenance probes at approximately two-week intervals; this process was replicated across participants. This study was conducted over 15 weeks.

The following research questions guided this study:

1. What is the effect of self-regulation on the acquisition of science vocabulary of third-grade, Spanish-speaking ELLs with learning difficulties assigned to a bilingual program?
   (a) What is the effect of self-regulation on the acquisition of receptive word definitions of ELLs with learning difficulties?
   (b) What is the effect of self-regulation on the acquisition of expressive oral word definitions of ELLs with learning difficulties?
2. What are the perceptions of third-grade ELLs with learning difficulties concerning self-regulation in learning vocabulary?

The results were organized into three main sections: (a) results of receptive vocabulary knowledge, (b) results of expressive vocabulary knowledge, and (c) participants' perception of self-regulation. The first section provided outcomes from the receptive vocabulary knowledge tests. The second provided outcomes from the expressive vocabulary knowledge tests of each participant. The outcome data were analyzed by comparing means between phases and observing level changes. The third section described detailed interview results for each participant.

Individual Results on Receptive Vocabulary Knowledge

Figure 4.1 displays the scores for each participant on the receptive definitions tests during baseline, training, intervention, and maintenance. The receptive definitions test measured whether the student recognized definitions of the six target words. Student's response for each target word was scored 0 or 1 point; therefore, the score range in the receptive definitions test was 0 to 6 points per session.

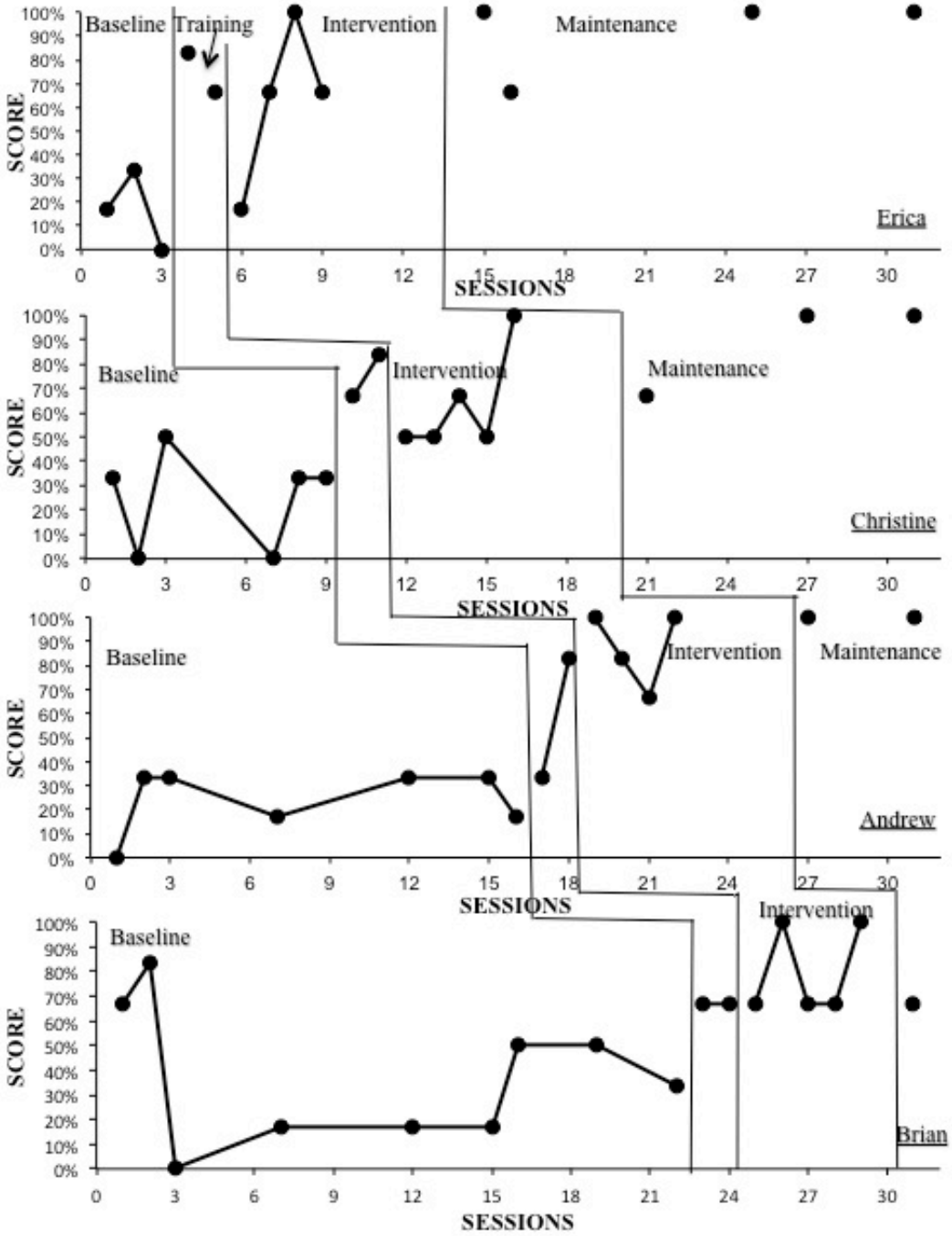


Figure 4.1. Percentage scores on the receptive definitions tests

Erica

Baseline. The top panel of Figure 4.1 displays Erica's results on the receptive word definition measure. Erica took three baseline probes and the outcomes on the receptive definitions tests were relatively low (*M*=16.7%). Individual scores on the tests were 16.7%, 33.3%, and 0.0%, respectively. The low and decreasing baseline performance indicated that the instruction she was receiving was not effective and an additional strategy was necessary.

Training. Self-regulation training was conducted over two sessions, and Erica ac scores on the receptive definitions tests (*M*=75%) improved. Erica's score immediately increased from 0.0% to 83.3% at the onset of training. She scored 83.3% in the first training session and 66.7% in the second. This change of level between baseline and training phases showed that self-regulation influenced her acquisition of word definitions.

Intervention. After two sessions of training, the intervention phase began; a total of four sessions were implemented. During this phase, Erica was required to use self-regulation without researcher's prompts; thus, it was more challenging than the training phase. Her scores on the receptive definitions tests were high (*M*=62.5%) relative to baseline but lower than training. Her beginning score on the test during this phase was low (16.7%). However, the scores dramatically increased over the sessions; her percentage scores in the four sessions were 16.7%, 66.7%, 100%, and 66.7%, respectively. She scored higher on the tests for three consecutive sessions than the baseline. She scored 100% in the third session. These findings indicated that self-

regulation was useful in vocabulary acquisition (focusing on word definition) whether it was used with or without researcher's prompts.

Maintenance. Two weeks after the intervention phase, the maintenance probes were implemented; they were repeatedly administered at approximately two-week intervals. However, spring break occurred during the maintenance phase; thus, there was a three week interval between the second and third probe. Erica received four maintenance sessions and her scores in the sessions were consistently high (*M*=91.7%). Her scores in the four sessions were 100%, 66.7%, 100%, and 100%. These results demonstrated that self-regulation had a long-term effect on vocabulary acquisition.

Christine

Baseline. The second panel of Figure 4.1 displays Christine's results on the receptive word definition measure. Christine received a total of six sessions during the baseline phase, with three probes for first participant selection and the other three probes before beginning the training phase. Her scores on the receptive definitions tests were low with variability (*M*=25%; range=0 to 50%). Her scores during the beginning three sessions varied (*M*=27.8%; range=0 to50%); however, the scores in the other three sessions before the training phase were low and relatively stable (*M*=22.2%; range=0 to 33.3%). Her test scores in the three sessions before beginning the training phase were 0.0%, 33.3%, and 33.3%, respectively. The low performance during those sessions showed that she needed an additional strategy.

Training. Two sessions of self-regulation training were implemented. Christine's scores on the receptive definitions tests were high (*M*=75%) relative to the baseline phase. She scored 66.7% in the first training session and 88.3% in the second. Her score increased from 33.3% to 66.7% at the onset of training. This change of level between baseline and training phases showed that self-regulation influenced her acquisition of word definitions.

Intervention. Christine received five intervention sessions. During the intervention phase, she used self-regulation without researcher's prompts. Mean score on the receptive definitions tests during this phase were higher (*M*=63.3%) than the baseline phase. Her scores in the five sessions were 50%, 50%, 66.7%, 50%, and 100%, respectively. Although her beginning score of this phase decreased compared to training from 83.3% to 50%, her scores increased over the course of the intervention, and she scored 100% in the final session of this phase. This indicated that for Christine, self-regulation was an effective strategy for learning vocabulary, and that she could use self-regulation effectively without help.

Maintenance. Two weeks later, the three maintenance probes were implemented. Additional probes were administered at approximately two-week intervals. Her scores on the maintenance probes were high (*M*=88.8%). Her scores in the three sessions were 66.7%, 100%, and 100%.

Andrew

Baseline. The third panel of Figure 4.1 displays Andrew's results on the knowledge of receptive word definition. Andrew received a total of seven baseline probes; he received the first three probes at the beginning of the study during participant selection. The next two sessions were implemented when Erica and Christine each initiated the intervention, to verify that the self-regulation affected their performance. These two students obtained higher scores than Andrew, demonstrating the positive effects of the intervention. The other two sessions were implemented before beginning the training phase. His scores in those sessions were low and stable (*M*=23.8%; range=0 to 2). A decrease in his scores in the last two sessions suggested that training should begin (33.3% and 16.7%, respectively).

Training. Two sessions of self-regulation training were implemented. Andrew's scores on the receptive definitions tests were high (*M*=58.3%) relative to the baseline phase. He scored 33.3% in the first training session, showing slight growth from the last baseline probe. However, it increased to 88.3% in the second training session. This rapid change of level over the course of the training sessions showed the impact of self-regulation on acquisition of word definition.

Intervention. Andrew received four intervention sessions. During the intervention phase, he used the self-regulation without researcher's prompts. However, his scores on the receptive definitions tests were even higher (*M*=87.5%) than those of both the baseline phase and training phase. He scored 100% on the test at the onset of

intervention. His scores in the four sessions were 100%, 83.3%, 66.7%, and 100%, respectively; all the scores during this phase were higher than the scores during the baseline phase. These results indicated that self-regulation was a critical strategy that influenced vocabulary acquisition abilities, and that a student could use self-regulation effectively without help.

Maintenance. Two weeks later, the two maintenance probes were implemented. Maintenance probes were conducted at approximately two-week intervals, and he maintained a high level of performance (*M*=100%).

Brian

Baseline. The bottom panel of Figure 4.1 displays Brian's results on vocabulary knowledge of receptive word definition. Brian received a total of nine sessions during the baseline phase. His scores on the receptive definitions tests were generally low but variable (*M*=37.0%; range=0% to 83.3%). The scores in the beginning three sessions of the study varied. His scores were high in the first two sessions (66.7% and 83.3%, respectively) but dramatically decreased on the third (0%). Three other baseline sessions were implemented at the same points when Erica, Christine, and Andrew each initiated the intervention; the fact that Brian's scores were lower (*M*=27.8%) than those of the other students who received the intervention verified the positive effects of intervention. His scores increased slightly before beginning the training. This could be due to more frequent vocabulary instruction relative to the other students during baseline. The training phase began when his scores displayed a descending trend.

Training. Two sessions of self-regulation training were implemented. Brian's scores on the receptive definitions tests increased to 66.7% from a score of 33.3% in the final session of the baseline phase. He obtained the same scores in the two training sessions (*M*=66.7%). This level change from baseline to training phases showed the impact of self-regulation on the acquisition of word definition.

Intervention. Brian received five intervention sessions. During the intervention phase, he used self-regulation without researcher's prompts. Although the instruction was implemented in an advanced level, his scores on the receptive definitions tests were the same or higher (*M*=80%; range=66.7% to 100%) than during the training phase. His increased performance was maintained at a high level; his scores in the five sessions were 66.7%, 100%, 66.7%, 66.7%, and 100%, respectively. This finding indicated that self-regulation contributed to vocabulary acquisition, and that a student could use self-regulation effectively without help.

Maintenance. Two weeks later, one maintenance probe was implemented. His score in the probe was 66.7%, demonstrating the delayed effect of self-regulation in vocabulary acquisition.

Summary of Results on Receptive Vocabulary Knowledge

The level changes and trends in data on the receptive definitions tests within each phase and across the phases demonstrated that self-regulation was effective in enhancing the acquisition of word meaning. Students were low performers overall when they received only direct vocabulary instruction (baseline). Although there was some

variability in the scores, they became stable over time. Once trained in self-regulation (training), students' performance immediately improved. Even when students used self-regulation without prompts (intervention), they still obtained higher scores than they had in the baseline sessions (i.e., three sessions before beginning training). Only Erica obtained a score lower than baseline for the first intervention session. Students' improved performance continued over time. The students (except Brian) reached the highest scores (100%) during the maintenance phase. Although his score was not 100%, it was still higher than his scores during baseline.

Individual Results on Expressive Vocabulary Knowledge

Figure 4.2 displays the scores of each participant from the expressive definitions tests during baseline, training, intervention, and maintenance. The expressive definitions test measured the student's abilities to recall and describe the meanings of the six target words verbally. The student's response for each target word was scored from 0 to 3 points depending on accuracy. The score range in the expressive definitions test was from 0 to 18 points per session.

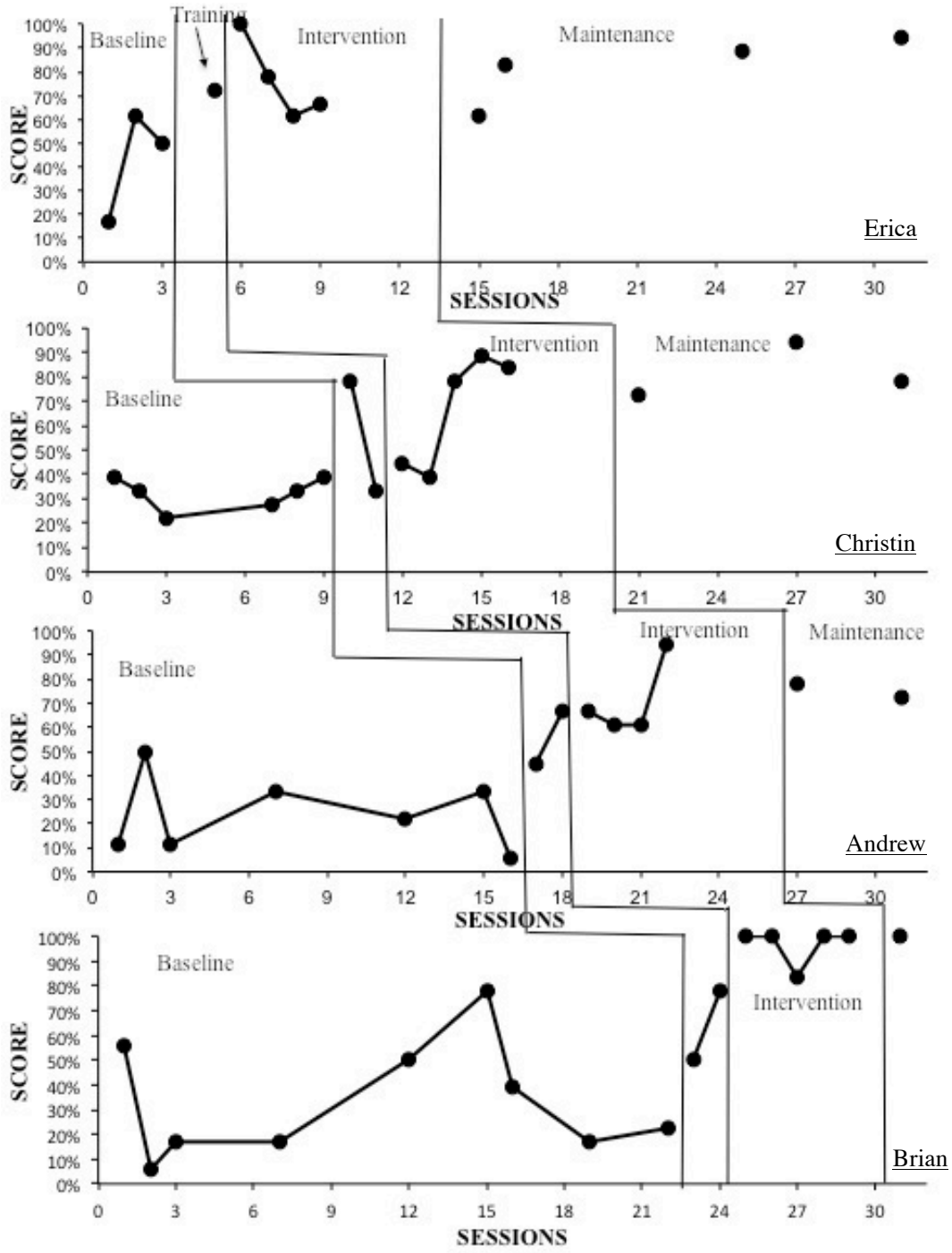


Figure 4.2. Percentage scores on the expressive definitions tests

Erica

Baseline. The top panel of Figure 4.2 displays Erica's results on the expressive word definition measure. Erica received three baseline sessions, and her outcomes on the expressive definitions tests were relatively low and variable (*M*=42.6%; range=16.7 to 61.1%). Her scores on the three tests were 16.7%, 61.1%, and 50.0%, respectively, showing a decreasing trend.

Training. Erica received two sessions of self-regulation training. However, she refused to take an oral definitions test in the first session, and there was a test score in only the second session. Her score increased to 72.2% from an average score of 42.6% during the baseline phase. This result indicated that self-regulation influenced her acquisition of verbal word definition.

Intervention. After training, the intervention phase began. In this phase, Erica used the self-regulation without the researcher's prompts. She had four sessions during the intervention phase, and her mean score was 76.4%. In particular, the score earned in the first intervention session was 100%; that is two times higher than the final score during the baseline. Her scores in the four sessions were 100%, 77.8%, 61.1%, and 66.7%, respectively. She scored the same or higher on the tests in three sessions during the intervention phase than she did in the baseline sessions. These findings indicated that self-regulation assisted her in learning and accurately understanding the word meanings.

Maintenance. Two weeks after the intervention phase, the maintenance probe was implemented. Maintenance probes were conducted at approximately two-week

intervals. However, spring break occurred during the maintenance phase; thus, the second and third probes were implemented at a three-week interval. Erica received four maintenance sessions and her scores in the sessions were high (*M*=81.9%) and consistently increased over time. Her scores in the four sessions were 61.1%, 83.3%, 88.9%, and 94.4%. These results showed a long-term effect of self-regulation in vocabulary acquisition.

Christine

Baseline. The second panel of Figure 4.2 displays Christine's results on knowledge of expressive word definition. Christine received a total of six sessions during the baseline phase, with three probes for first participant selection and the other three probes before introducing the training phase. Her outcomes on the expressive definitions tests were low and stable (*M*=32.4%). Her scores in the three sessions before beginning the training phase were 27.8%, 33.3%, and 38.9%, respectively. The low performance during the baseline phase showed that she needed an intensive intervention.

Training. Christine received two sessions of self-regulation training. Her mean sore on the expressive definitions tests was higher (*M*=55.6%) than the baseline scores. Her score increased immediately to a high level after the initiation of training (77.8%). An increase from baseline to training phases indicated the influence of self-regulation on accurate knowledge of word definition. However, she obtained a low score in the second session (33.3%).

Intervention. Christine received five intervention sessions. During the intervention phase, she used self-regulation without researcher's prompts. All scores except those in the second session on the expressive definitions tests during this phase were higher (*M*=73.6%) than the baseline phase. Her score in the second session was the same as the highest baseline score (38.9%). Her scores in the first two sessions during the intervention phase were the same or slightly higher than baseline. However, her scores rapidly increased to a high level and remained stable (*M*=83.3%). Her scores in the five sessions were 44.4%, 38.9%, 77.8%, 88.9%, and 83.3%, respectively. This rapid level change across phases showed that self-regulation enhanced the ability to accurately understand word meanings.

Maintenance. Two weeks after the intervention phase, the maintenance probes were implemented. Three maintenance probes were provided at two-week intervals. Her score increased to 94.4% and she maintained high scores (*M*=81.5%). Her scores in the three sessions were 72.2%, 94.4%, and 77.8%, respectively. These results also showed a long-term effect of self-regulation on vocabulary acquisition.

Andrew

Baseline. The third panel of Figure 4.2 displays Andrew's results on knowledge of expressive word definitions. Andrew received total of seven baseline probes. He received the first three probes at the beginning of the study for selection of the first participant. The next two sessions were implemented when Erica and Christine each initiated the intervention, to verify that the self-regulation affected the performance of

Erica and Christine; these two students obtained higher scores than Andrew, demonstrating the positive effect of the intervention. The other probes were implemented prior to the training phase. During baseline, his performance on the expressive definitions tests was low (*M*=23.8%). His scores were relatively unstable during the beginning three sessions, but they became stable over time. The training phase began when the scores decreased to the lowest level (5.6%).

Training. Two sessions of self-regulation training were implemented. Andrew's mean score on the expressive definitions tests was high (*M*=55.6%) relative to the baseline phase. His scores in the two sessions were 44.4% and 66.7%, respectively, displaying an increase.

Intervention. Andrew received four intervention sessions. During the intervention phase, he used the self-regulation without researcher's prompts. In all sessions during intervention phase, he obtained higher scores on the expressive definitions tests (*M*=70.8%) than baseline, and the score in the fourth session increased to 94.4%. His scores in the four sessions were 66.7%, 61.1%, 61.1%, and 94.4%, respectively. These outcomes indicated that self-regulation developed the ability to accurately understand word meanings.

Maintenance. Two weeks later, the two maintenance probes were implemented. Maintenance probes were conducted at approximately two-week intervals. His high performance was maintained over time (*M*=75.0%). His scores in the two sessions were

77.8% and 72.2%, respectively. These outcomes demonstrated the delayed effect of self-regulation on vocabulary acquisition.

Brian

Baseline. The bottom panel of Figure 4.2 displays Brian's results on knowledge of expressive word definition. Brian received a total of nine sessions during the baseline phase. His scores on the expressive definitions tests were low with variability (*M*=33.3%; range=5.6% to 77.8%). His scores in the middle three sessions were high but variable (*M*=55.6%; range=38.9% to 77.8%) relative to the other probes; this might be due to more frequent vocabulary instruction than the other students received. Baseline probes continued until he showed low performance and established stability. The training began when a decreasing trend for three consecutive sessions was observed.

Training. Two sessions of self-regulation training were implemented. Brian's scores on the expressive definitions tests increased to 50.0% from a score of 22.2% in the final session of the baseline phase. His score increased to 77.8% in the second session (*M*=63.9%).

Intervention. Brian received five intervention sessions. During the intervention phase, he used the self-regulation without researcher's prompts. Although the instruction was implemented in an advanced level, he obtained the highest scores on the expressive definitions tests (*M*=96.7%). His scores in the five sessions were 100%, 100%, 83.3%, 100%, and 100%, respectively. The rapid level change across phases indicated that self-

regulation might be an important strategy in understanding word meanings accurately, and that a student could use self-regulation effectively without help.

Maintenance. Two weeks later, one maintenance probe was implemented. His score in the probe was 100%, demonstrating a long-term effect of self-regulation on vocabulary acquisition.

Summary of Results on Expressive Vocabulary Knowledge

Visual inspection of students' scores on the expressive definitions tests revealed that all students increased performance after introducing self-regulation. This improvement across phases showed that self-regulation was effective in increasing students' abilities to accurately acquire word meaning. Students' performance was low with stability overall when the students received vocabulary instruction without any self-regulation strategy (baseline). However, their performance immediately improved after training of self-regulation (training). Moreover, their average scores when using self-regulation without prompts (intervention) were even higher than the average scores during training. The improved performance continued with stability. Students' average scores during the maintenance phase were higher than in the intervention phase.

Student Interviews

Following this study, the researcher interviewed each student individually to obtain data on the perceived preferences, usefulness, and recommendations of the intervention. Interview data revealed that the students used self-regulation with different perceptions.

First, the students voiced varied opinions on the preferences and usefulness of the direct vocabulary instruction routine. Three students chose the sentence-making activity, seeing pictures, and the true/false question activity as a preferred activity, respectively; but Andrew chose all the activities. As for a helpful activity, the three students chose sentence-making, word review, and true/false question, respectively; Andrew did not select any activity.

Regarding the self-regulation strategies, most students enjoyed using them. They also perceived that those strategies were useful. Yet, they had different opinions on the preference and usefulness across the strategies. When they were asked whether they preferred self-goal setting or self-monitoring (self-assessment and self-recording), Christine and Andrew selected self-monitoring. They indicated that it helped them understand words. Erica and Brian liked self-goal setting; both indicated that it increased their academic confidence. When asked which of those strategies was most helpful, Christine, Andrew, and Brian selected self-monitoring, explaining that it helped them review the vocabulary learning process or memorize the word's meaning. Erica selected self-goal setting but did not give the reason. Also, Erica indicated that self-monitoring (self-assessment and self-recording) was not helpful in vocabulary learning. Despite their varied opinions about self-regulation, all of them recommended self-assessment as a desirable strategy in vocabulary instruction for students. Interview questions and students' answers are presented in Appendix H.

CHAPTER 5. DISCUSSION

This study examined the effectiveness of self-regulation in conjunction with direct vocabulary instruction on the acquisition of word knowledge by third-grade ELLs with learning difficulties. Students' performance on the receptive definitions tests and expressive definitions tests improved after introducing self-regulation. These results showed that self-regulation had a positive influence on the acquisition of word definition by ELLs with learning difficulties.

This chapter describes the major findings that address the research questions and provides conclusions drawn from the findings. Implications for practice, limitations, and future research recommendations are provided as well.

Discussion of Results

Limited Effect of Direct Vocabulary Instruction

Students were provided direct vocabulary instruction during the baseline phase. Words were taught directly following a systematic instruction routine. The routine consisted of meaningful instructional learning activities: providing student-friendly definitions, explaining the meaning in context, questioning to recognize the meaning in sentences (true/false question game), creating sentences using the target word (sentence-making), and word review. Direct instruction has been effective in increasing ELLs' vocabulary acquisition (August et al., 2005; Carlo et al., 2004; Gersten et al., 2007). These studies included student-friendly definition and presenting the target word's meaning in context are important in teaching vocabulary to ELLs (August et al., 2005;

Beck et al., 2002); Beck et al. also recommended games or activities using the words as key components of vocabulary instruction to help students interact with the word effectively.

However, the results of the current study contradict the findings of previous studies. Students showed low levels of acquisition of word definitions when they were only provided with direct vocabulary instruction. The average score was 25.6% on the receptive definitions tests and an average of 33% on the expressive definitions tests when only direct vocabulary instruction was implemented.

There were two differences between the current study and previous studies that demonstrated the effectiveness of direct vocabulary instruction. One difference is the characteristics of the participants. The above research, except for Beck et al. (2002), targeted ELLs whose academic levels were not specified. They assumed that students' low academic level was due to their limited language proficiency. However, the current study targeted ELLs with learning difficulties assuming that students' low academic levels would impact their achievement above and beyond what might be expected from limited English proficiency alone. The fact that Andrew;s scores were low throughout the baseline showed the possibility that he might have another problem in addition to the language barrier. His scores doubled during intervention clearly showing that his low learning skills affected his low academic performance. Although, the participants in Coyne, McCoach, and Kapp (2007) and Coyne, McCoach, Loftus, et al. (2009) were not ELLs, they ,also found that students with LD were less responsive to direct vocabulary

instruction and that they needed extensive instruction. The authors suggested that teachers should control the intensity of an intervention to match the student's achievement level.

The other difference is the difficulty level of the task. The current study investigated the effects of direct instruction on science words, while the previous studies examined the effects on words from the reading texts. The research literature reflects the fact that acquisition of vocabulary in science (specialized words) requires more work than the vocabulary in general reading texts, because of the unique characteristics of science terms. These terms are precise, information-oriented, and include concepts (Bailey et al., 2004; Ciechanowski, 2009). Therefore, the ELLs with learning difficulties are likely to require more intensive interventions.

Intensive Intervention: Self-Regulation in Conjunction with Direct Instruction

Students' results during the baseline phase proved the need for intensive intervention. After self-regulation was added to vocabulary instruction, students' performance on the acquisition of word definitions improved. Students obtained on average 73.3% on the receptive definitions tests and an average of 79.4% on the expressive definitions tests during the intervention phase. Also, the performance of all students except Erica was close to 100% on receptive definitions tests as well as expressive definitions tests after three or four self-regulation sessions. All students except Brian reached 100% on receptive definitions tests during maintenance, and all except Andrew reached 100% on expressive definitions tests during maintenance. Brian was

provided only one session of maintenance and Andrew was provided two sessions of maintenance because of the limited time frame; the limited number of sessions might have led to their lower scores on both receptive definitions and expressive definitions tests. These findings are consistent with results in the syntheses of self-regulation to improve academic achievement (Konrad et al., 2007; Reid, 1996). Students' outcomes during intervention and maintenance proved that self-regulation was a critical component in composing intensive intervention.

An intervention with multiple strategies was more effective than with a single strategy (Gajria et al., 2007; Gersten et al., 2001). Specifically, self-regulation was strongly recommended as an additional strategy to intensify the effect of intervention (Gajria et al., 2007; Gersten et al., 2001; Reid, 1996). The literature on the relationship between self-regulation and academic learning explained that academic change by self-regulation is attributed to self-efficacy (Schunk & Ertmer, 2000). Schunk and Ertmer stated that self-regulation increases self-efficacy and motivation in learning; ultimately, self-regulation improves academic achievement. They indicated self-goals, self-monitoring of progress, and self-evaluation as interventions to enhance self-efficacy.

In this study, self-regulation consisted of self-goal setting and self-monitoring. First, self-goal setting seems to be an important factor in improving academic performance, based on the test outcomes and student interview results. The students established a specific and personal goal at the beginning of the class; they established a goal for the number of words to be acquired in each lesson. The students set high goals

(range=4 to 6 words). Brian and Erica selected six, the highest possible, during all sessions. Brian's scores immediately increased after introducing self-regulation and remained high until the final session. Erica also obtained high scores, but they varied relative to Brian, indicating that the relationship between the level of goal set and test scores are not consistent with this population. On the other hand, the goal range of Andrew and Christine was from 4 to 6, which is slightly lower than that of the other two students. While Andrew's goal was inconsistent, Christine's goal became higher over time. The inconclusive results of those students showed that the goal level is not directly related to test scores. However, enhanced performance under the self-regulation intervention showed the possibility that self-goal setting itself could be associated with self-efficacy. Many ELLs usually have low self-efficacy and a passive attitude despite their potential (Konrad et al., 2007; Rodriguez et al., 2009). ELLs could increase academic performance, while self-regulating their learning behaviors based on enhanced self-efficacy (Gersten & Baker, 2003; Konrad et al., 2007).

Second, the students monitored their performance during review. Results indicated that self-monitoring might affect their academic performance. In the baseline phase, when self-regulation was not provided, the students reviewed the target words, reading the words' definitions quietly using the definition sheet. Andrew pretended to review the words and played with a pencil. However, after self-regulation training, all of them (including Andrew) were actively involved in word review and assessed whether they understood each word (self-monitoring) at the same time. For example, the students

reviewed the words and definitions; then, if they were confident in understanding the word, they highlighted the word printed on the self-regulation sheet. Then, they counted highlighted words and marked the number counted (i.e., 1 word, 2 words) on the self-monitoring table.

Students expanded the function of self-monitoring by frequently using it on their own. It was observed that Erica and Christine expanded the use of self-monitoring beyond the review at the end of the lesson to other activities of instruction such as the games, sentence-making, and review of the target word in the middle of the lesson. They monitored their understanding of each word during word instruction, as well as during review, from the third session of intervention. Furthermore, the students modified the word-review method after they began using self-monitoring. Erica and Brian highlighted all six words every session, since they wanted the highest score (100%). Thus, for the words they failed to understand, they reviewed the definitions on the sheet again until they could highlight all the words. Andrew used self-monitoring and connected it to self-goal setting. He compared his goal and the score in self-monitoring; it seemed that he identified his potential and was motivated by this process. These findings supported the results in previous research of positive effects of self-monitoring on academic achievement (Harris et al., 2005; Konrad, et al., 2007; Schunk & Ertmer, 2000). The research indicated that a student participated in class with an active attitude and an increased attention span through self-monitoring. Therefore, self-monitoring increased

task-involvement, thereby improving the academic performance of students (Harris et al., 2005; Konrad et al., 2007).

We need to remember that the current study focused exclusively on ELLs with learning difficulties. Previous studies of vocabulary for ELLs have developed instruction that focused on the language characteristics of ELLs, but not on strategies for those who needed additional support (Gersten et al., 2007). Gersten et al. suggested using daily small-group intervention or lengthy intervention as an intensive intervention. However, there are practical limitations in the use of the suggested intervention. For example, students will miss classes in other subjects if they are pulled out for the additional instruction. Also, a teacher may not have sufficient time to provide an additional class. Thus, the current study searched for a strategy that can be combined with existing instruction and can facilitate the effect of the existing instruction at the same time. This study found that self-regulation was an appropriate strategy that satisfied both conditions. The results demonstrated that self-regulation was well matched with direct instruction for the acquisition of word meaning. Self-regulation in conjunction with direct instruction led to significant improvement in students' word acquisition.

Effects of Intervention on Breadth and Depth of Word Knowledge

The current study examined the relative effects of the intervention (self-regulation in conjunction with direct vocabulary instruction) on the amount (breadth) and quality (depth) of word learning. Breadth of knowledge refers to how many words the students learned (Coyne et al., 2009; Nagy & Scott, 2000). This study used the receptive

definitions tests (i.e., whether the students recognized the definition of the word) to measure breadth. The test used a 2-point scale (correct and incorrect). Depth of knowledge refers to how well they learned the words (Coyne et al., 2009; Nagy & Scott, 2000); this study used the expressive definitions test to measure depth. In the expressive definitions test, the students were required to describe the meaning of the target word verbally. The tester scored the response using a 4-point scale: (a) 0 points for an unrelated response or no response, (b) 1 point for minimal partial knowledge, (c) 2 points for an incomplete response displaying substantial partial knowledge, and (d) 3 points for a totally correct answer (Nagy, Herman, & Anderson, 1985).

Results showed that the students were able to increase breadth and depth of word acquisition by receiving the intensive intervention, extending the findings from prior studies (Beck et al., 2002; Biemiller & Boote, 2006; Coyne et al., 2009) to include ELLs with learning difficulties. It was evident that the scores on the receptive and expressive definitions tests after self-regulation training were higher than baseline. On the receptive definitions tests, students' performance (except Erica) immediately improved when the intervention was initiated. Erica's scores began to improve with the second session.

In the meantime, students' (except Erica's) performance on the expressive definitions tests improved over the sessions during the intervention phase. Christine showed noticeable improvement from the third session and Andrew did so from the fourth session; their improved performance continued. The fact that it took longer for the students to show improvement on this measure may be due to the expressive nature of the

task. This task is more difficult than the receptive matching task. Brian's scores were 100% in all sessions except the third one during the intervention. Erica's performance immediately increased after receiving the intervention (100%); however, her performance decreased in the second and third sessions. Nevertheless, she consistently scored higher after the fourth session and reached 94.4% in the final one.

Based on these results, this study found that the expressive definitions tests were more sensitive to the intervention relative to the receptive definitions tests, suggesting that the intensive intervention was more influential on depth of word learning than it was on breadth of word learning. Nevertheless, during the maintenance phase, all students consistently performed highly on receptive definitions tests as well as expressive definitions tests; however, Brian did not perform highly on the receptive definitions test. These results indicated that self-regulation is effective on both the breadth and depth of vocabulary learning, and that the students' improved performance remained consistently high and stable.

Perception of the Intervention: Student Interviews

This study examined the perceptions of students on preferences, efficacy, and recommendations of direct vocabulary instruction and self-regulation. As for the direct vocabulary instruction routine, interview results revealed that students enjoyed learning vocabulary following the routine. They also perceived that direct vocabulary instruction was helpful in improving vocabulary. When students were asked about favorable or helpful parts, they selected the true/false question game (i.e., recognize the word meaning

in sentences), sentence-making (i.e., creating a sentence including the word), or visuals. One possible reason is that students enjoy dynamic interactions with words (Beck et al., 2002). When asked about less helpful parts of the instruction, students chose reading words' definitions and reviewing the words quietly, which supported above assumption.

Students have a positive perception of self-regulation. These students responded, "I do not know" to the negative questions (e.g., what things did you not like?). Between the self-goal setting and self-monitoring, Erica and Brian preferred self-goal setting, and Brian said the reason was "I feel like I know a lot". Christine and Andrew preferred self-monitoring, and the reason was that it helped them identify the level of understanding. As for the perception of efficacy, all students except Erica indicated that self-monitoring was a helpful strategy. This result supported the finding of a previous study that students liked self-monitoring of performance, since it helped them learn more (Harris et al., 2005). All students agreed in recommending self-monitoring as a good instructional strategy. This result emphasized the fact that self-monitoring was an appealing strategy to the students. In spite of this, we need to address the fact that the students also indicated that self-monitoring was the most difficult strategy.

This information suggested that self-regulation is a beneficial strategy in improving vocabulary ability of ELLs with learning difficulties, since it improves not only self-efficacy but also the attention span during learning. Still, self-monitoring needs elaborate training if students with learning difficulties are to use it easily.

Implication for Practice

Gersten et al. (2007) noted that many teachers struggle in teaching academic vocabulary to ELLs; thus, it is necessary that teachers be trained to provide instructional strategies. Some teachers gauge students' knowledge inaccurately and thus use the wrong approach (Gersten et al., 2007). Teachers have a responsibility to identify students' level of performance early and then provide the appropriate intervention based on their findings. Based on the literature review on academic vocabulary instruction, the interventions that showed high effects on the vocabulary acquisition of ELLs included: providing student-friendly definitions; providing word meanings in various contexts; involving students in word learning through activities such as discussing, comparing, analyzing, and using the target words; providing multiple exposure to meaningful information about the target words; and frequent word review and practice (August et al., 2005; Beck et al., 2002). This study developed direct vocabulary instruction, which included the above components.

Teachers also need to know a strategy that makes the intervention more intensive for students who need additional support. The results of this study suggested self-regulation as one critical strategy in formulating intensive intervention. Generally, based on the literature review, direct instruction was recommended for the academic vocabulary instruction of ELLs (August et al., 2005; Gersten et al., 2007). Thus, it is suggested that teachers start with direct instruction when teaching academic vocabulary to ELLs. If students perform well with direct instruction, teachers could use that strategy exclusively.

However, if students show low or unstable performance, teachers would need to adjust the intervention to meet students' levels. The students in this study did not respond to the direct instruction; it might be due to their limited learning abilities, or the task might be too challenging for them. The students' academic performance was significantly improved by adding self-regulation to direct instruction.

Next, the positive effects of self-regulation on academic achievement have been demonstrated in many studies (Konrad et al., 2007; Reid, 1996). Self-regulation consists of many strategies such as self-goal setting, self-monitoring, self-instructions, self-evaluation, and self-reinforcement; it has been also used in a variety of ways. Thus, it is difficult to know whether certain strategies in self-regulation were more effective than others. Nevertheless, by analyzing its results, this study identified three variables that may be critical to instruction that uses self-regulation: (a) using the self-regulation guidance sheet, (b) modifying self-regulation format to meet student's specific learning goal, and (c) making students aware of the purpose of using the strategies. First, it would be useful for students to use self-regulation with a self-regulation guidance sheet. Its importance was identified in the study by Lee et al. (2009). By using the sheet, students could implement self-regulation without teacher prompts. Thus, the students do not have to be pulled out, but can learn with peers in the general education classroom.

Second, teachers can modify self-regulation to whichever format meets a particular instruction goal. For example, teachers could use self-monitoring of attention instead of self-monitoring of performance for a behavior change; also, teachers could

modify self-regulation by varying the frequency, depending on the difficulty level of a task. Harris et al. (1994) indicated that instructional strategies should be appropriate to target behaviors and efficient to use not only for teachers but also for students. The goal of the current study was for the students to acquire the meanings of six science words. Six words were taught in each session. The words were taught using the direct instruction routine consisting of several activities; thus, how much the students contributed to those activities was a critical factor in their performance level. Therefore, this study selected self-goal setting and self-monitoring. Students could set quantifiable goals at the beginning of the lesson. The students became actively engaged in learning activities by monitoring their performance. Furthermore, these self-regulation strategies were efficient to use. They were simple and did not need additional time since they were incorporated into the existing strategy.

Third, it is important that students know the purposes of using the intervention. Teachers should focus on these purposes in the self-regulation training. Self-regulation is effective, since it increases students' self-efficacy and task-involvement (Konrad et al., 2007; Schunk & Ertmer, 2000). It also helps students control their learning and enhance their abilities to work independently and responsibly (Harris et al., 2005). In the current study, students consistently monitored their understanding after learning each word, although they were trained to monitor them during review at the end of class. Moreover, self-regulation makes students learn with responsibility (Harris et al., 2005). Andrew compared his goals and the results of self-monitoring. Christine was disappointed in

herself when her self-assessment result was not as high as expected (e.g., the number of highlighted words were not six). However, they did not respond to the interview questions that dealt with why self-regulation helped in word learning. If the students completely understand why self-regulation is used, all of them might show more rapid learning, instead of waiting for a couple of sessions.

Limitations

The current study was designed to provide high reliability and validity in providing the most effective answers to the research questions; this was done by controlling variables as much as possible. This study was implemented in an actual school; conducting the experiment with limited objects and materials was unavoidable. Consequently, there are several limitations that need to be considered when interpreting the results.

First, only four students participated in this study. Even though the intervention was effective for those four students, generalizing the findings to other populations must be done with caution. It should be noted that only a few students met the participation selection criteria. Additionally, self-regulation is a strategy that needs individual training; most studies about self-regulation were implemented with three to six students (Konrad et al., 2007).

Second, the target words in this study were science words. They were selected based on the academic word selection procedure (Espin et al., 2005). Although this procedure helped to ensure the adequacy and equivalence of the words, the words in this

study were limited to the field of science. Thus, care should be used when generalizing the effect of self-regulation to words in other fields such as social studies, even though the words are academic.

Third, this study used proximal measures; only measures of word meaning were administered. The measures (receptive definitions test and expressive definitions test) were developed based on the measures reported in the previous study of vocabulary learning for students with LD (Coyne et al., 2009). The receptive definitions test measured how many words the students understood (depth) (Coyne et al., 2009; Nagy & Scott, 2000), while the expressive definitions test measured how well the students understood the words (breadth) (Coyne et al., 2009; Nagy & Scott, 2000). These tests were limited to measuring knowledge of words' meaning. To examine its effects on other skills such as academic language or comprehension, further measures will be required.

Fourth, since self-regulation was used as a treatment package consisting of self-goal setting and self-monitoring, we cannot identify the effect of each strategy on the acquisition of word meaning.

Lastly, learning six words in one lesson would be challenging for ELLs with learning difficulties. However, it should be noted that the lesson focused on only word meaning, and 5 to 7 minutes were allotted to learning each word. Also, the results showed that the students could acquire all six words in one lesson, suggesting that the number of words were appropriate to them. Calro (2004) also taught 10 to 12 academic words each

week to ELLs, and the successful results reported in that study demonstrated that learning 12 words per week was not very demanding to ELLs.

Recommendations for Future Research

Several suggestions for future research can be made based on the findings of this study. First, the findings suggest that it may be worthwhile to replicate this study using a larger group to validate the findings. Also, it may be helpful to evaluate the use of self-regulation with groups that are stratified by academic achievement (e.g., high-achieving ELLs, average-achieving ELLs, low-achieving ELLs, or ELLs receiving special education) to identify a group to which self-regulation is most beneficial.

Second, it might be useful to extend the scope of self-regulation's usage to other academic areas such as comprehension or writing. A synthesis of self-regulation showed that it was effective on comprehension, math, or writing (Gajria et al., 2007; Konrad et al., 2007). Then again, most researchers conducted the treatment on students with LD. Future research needs to examine the effects of the treatment on ELLs' comprehension or writing skills. The literature review revealed that the generally effective interventions for EO students were also effective for ELLs; thus, using the interventions that are used for EO students may be effective for ELLs' instruction, rather than developing an intervention that is uniquely appropriate for ELLs (Salvin & Cheung, 2003). The results of further research may or may not support this hypothesis.

Third, this study developed self-regulation by combining self-goal setting and self-monitoring. As mentioned above, we cannot identify the effect of each individual

strategy, since self-regulation was used as a treatment package. Further research is needed that can examine the individual strategy's effect. This study combined two strategies based on the findings that multiple strategies were more effective on academic performance than a single strategy when using self-regulation (DiGangi et al., 1991; Sawyer et al., 1992). If students could improve academic performance sufficiently with just one strategy, they would not have to put extra effort with the implementation of more strategies. They could focus on the single strategy. Further research into the unique results of individual strategies will provide teachers useful ideas for using those strategies efficiently.

Summary

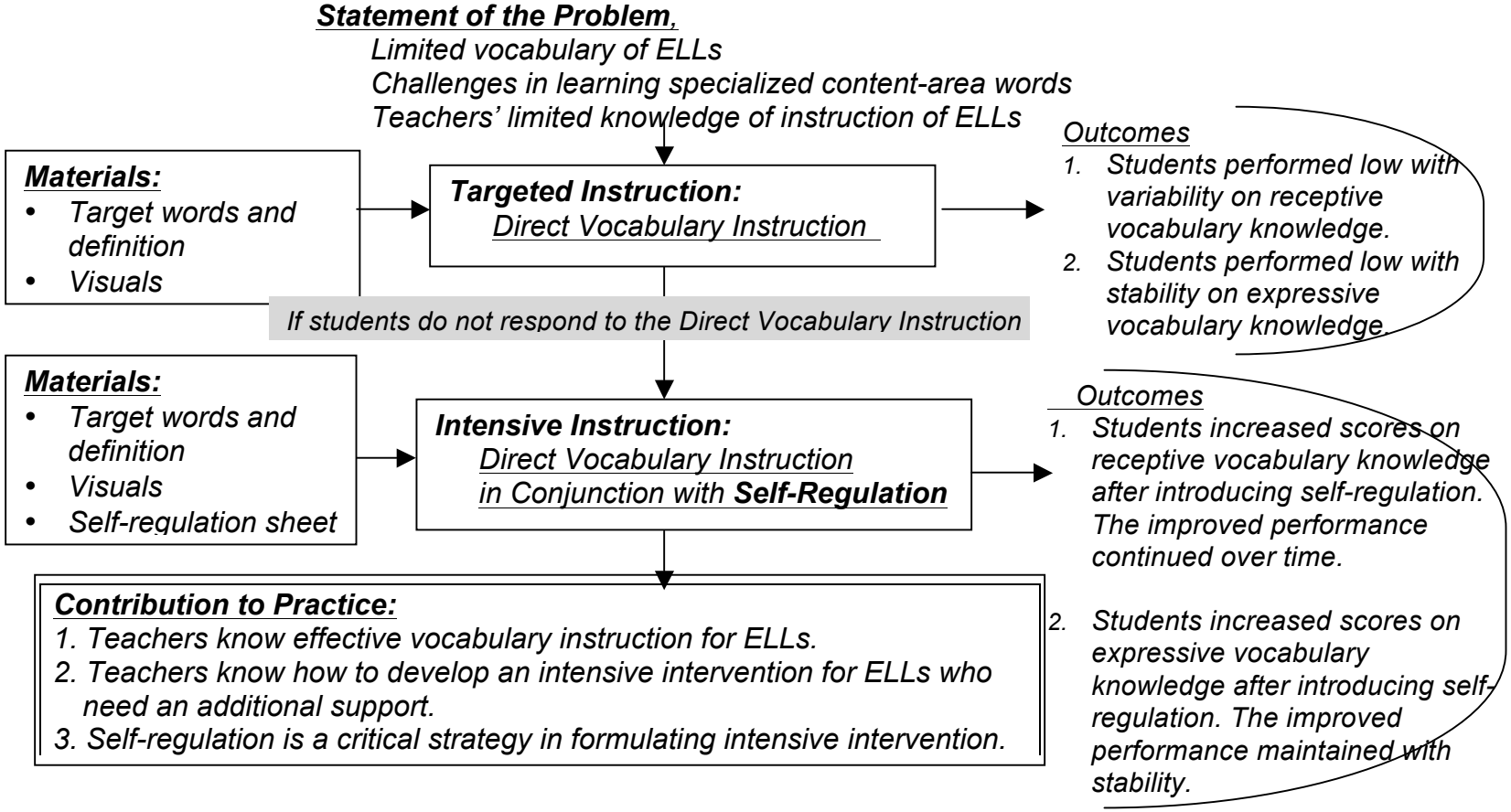
The purpose of this study was to examine the effects of self-regulation in conjunction with direct vocabulary instruction on the acquisition of science word knowledge of third-grade ELLs with learning difficulties. The students showed low performance on the acquisition of word knowledge when they were provided direct vocabulary instruction alone. Students' performance improved considerably after self-regulation was added to the direct instruction. The results for this study showed that ELLs with learning difficulties need an intensive intervention beyond direct vocabulary instruction; self-regulation could be a critical strategy in formulating an intensive intervention. The vocabulary instruction in this study focused on the acquisition of word meaning, as measured by the number of they learned (breadth) and how well they understood those words (depth). This study found that self-regulation in conjunction with

direct instruction was effective in improving performance in both breadth and depth of word knowledge. Students had a positive perception of self-regulation, although they reported different preferences in sub-strategies (self-goal setting, self-monitoring, and self-recording).

This study found three variables to guide teachers in using self-regulation efficiently: (a) using self-regulation with a guidance sheet, (b) modifying the self-regulation format to meet student's learning goal, and (c) making students aware of the purpose of using the strategies. Based on the limitations of this study, several ideas were suggested for further research, including using self-regulation with groups that are stratified by academic achievement, extending the scope of self-regulation to other subjects, and examining the effect of individual strategies (e.g., self-goal setting only or self-assessment only).

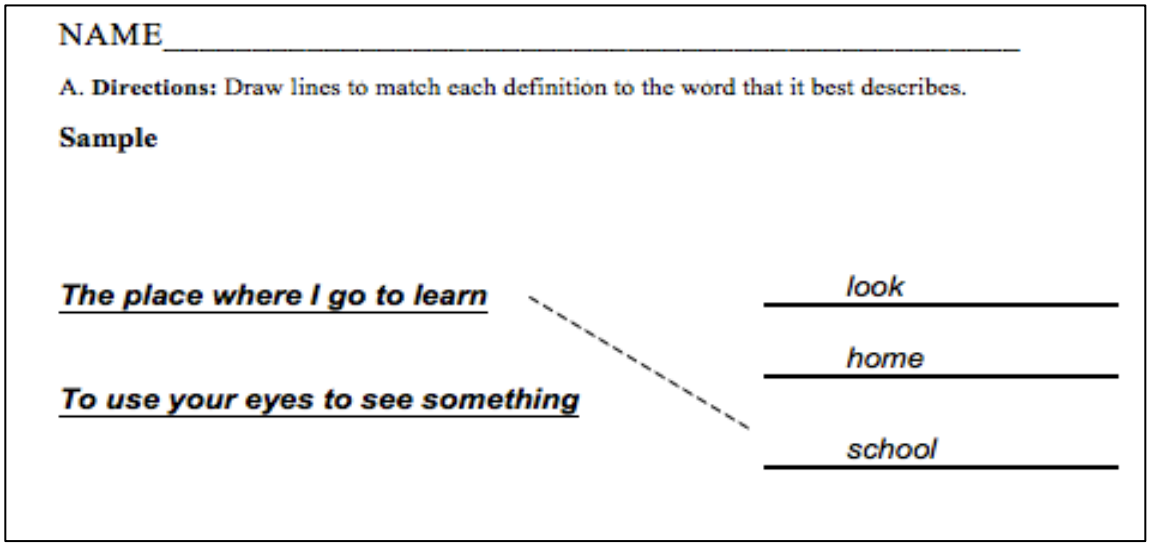
Appendix A

The Rationale for the Study



Appendix B

Vocabulary Knowledge Test


NAME_____

A. **Directions:** Draw lines to match each definition to the word that it best describes.

Sample

The place where I go to learn

To use your eyes to see something

look

home

school

An animal with a backbone that lives part of its in water and part on land

A developing animal before it is born or hatche

A stage in an insect life cycle between larva and adult

To come out of an egg

An action that an animal can do without

pupa

amphibian

embryo

instinct

arachnid

Appendix C

Daily Vocabulary Measures

Receptive Definitions Test

Tester – Kim,

LESSON 8.

When something dries up and becomes weak	*germination*
For a seed to begin to grow	*petal*
A mass of snow piled up by wind	*pollination*
The part inside each seed that has nutrients	*reproduce*
To move pollen to the stemlike part inside a flower	*seed leaf*
The process that new offspring is made by parents	*snowdrift*
	vaccine
	wither

Appendix D

Sample Lesson with Script

Lesson 8
Topic: Plants

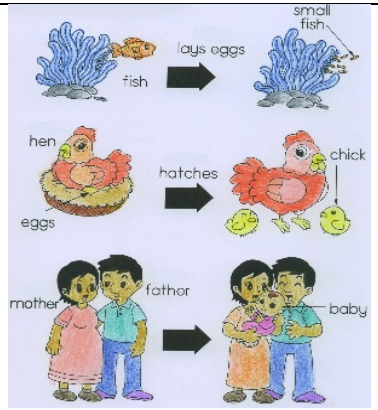
Vocabulary Word 2: *germination*

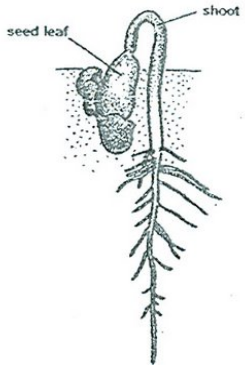
1. Introduce the word	*Our second word for today is germination.*
2. Activate prior knowledge of the word.	*Have ever heard the word germination?* *Think about the word germination. What do you know about the word?*
3. Discuss the word. • *Provide a student-friendly definition.*	*The definition for germination is:* *"The process a seed that has been planted goes through to begin to grow."* *Let's read the definition.*
• *Provide visuals.* • *Lead students in identifying word meaning in context.*	*(Show the picture of a seed breaking open)* *Can you explain what germination means? Think about how plants grow from seeds.* *A seed **germinates** when the tiny plant begins to grow and develop.* *A seed needs the proper (appropriate, fitting well) temperature, air, and water to begin to grow (or **germinate**).* *The seed soaks up the water and swells until the seed coat splits.* *A root grows out of the split seed coat down into the soil. Then the stem begins to grow upward.* *Let's read the definition again.*
4. Engage students in "deep-processing" activities with the word.	*Let's answer "true" or "false." to the following statements. Make sure you think about the word germination before answer to the question.* *"Students can learn about germination in a book about planets."* *"Susan can bake a germination in the oven."* *"You can see roots coming out of a seed during the process of germination."*

	5. Model to students and scaffold their creation of sentences.	*Let's make a sentence using the word germination. Remember, you should understand the meaning of a word to make a sentence.* *When you understand the meaning, you can use it correctly. An example sentence with germination is the following:* *"Germination happens when a baby plant begins to grow."* *Now, it is your turn. Think about the word germination. Please make a sentence.*

Appendix E

Pictures





Appendix F

Checklist for Treatment Fidelity

Direct vocabulary instruction: Researcher

Instructional Activities	Word number					
	1	2	3	4	5	6
Activating prior knowledge	1	1	1	1	1	1
Providing student-friendly definition	1	1	1	1	1	1
Explaining the word meaning in a context using examples and pictures	1	1	1	1	1	1
True/false question activity	1	1	1	1	1	1
Sentence-making activity	1	1	1	1	1	1
Word review	1	1	1	1	1	1

Note. Rating: 0 = disagree (no present). 1 = agree (present)

Self-regulation: Researcher

Self-regulation	Evaluation
Self-goal setting	1
Self-monitoring	1

Note. Rating: 0 = disagree (no present). 1 = agree (present)

Appendix G

Checklist for Learning Fidelity

Self-regulation: Student

Self-regulation	Evaluation
Self-goal setting	1
Self-monitoring	1

Note. Rating: 0 = disagree (no present). 1 = agree (present)

Appendix H

Student Interview: Questions and Answers

Erica

Direct vocabulary instruction routine

Question (Q) 1. Which activity was the easiest and which activity was the most difficult?

- *The easiest activity was 'saw pictures' and the most difficult one was 'review the word'*

Q 2. What things did you like most in the teaching routine and why?

- *Make a sentence.*

Q 3. What things did you not like in the teaching routine and why?

- *Review the word.*

Q 4. What things helped you to most understand the meaning of the words and why?

- *Make a sentence because I can learn more.*

Q 5. What things helped you least understand the meaning of the words and why?

- *When we review. It helped just a little bit.*

Self-regulation

Q 1. What things did you like most about using the self-regulation form and why?

- *Self-goal setting.*

Q 2. What things did you not like about using the self-regulation form and why?

- *Self-assessment because we just highlighted.*

Q 3. What things helped you the most to understand the meaning of the words and why?

- *Goal setting.*

Q 4. What things least helped you to understand the meaning of the word and why?

- *Self-recording (evaluation).*

Q 5. If you were going to choose one of these methods to teach your kids, which one would you choose and why?

- *Self-assessment*

Christine

Direct vocabulary instruction routine

Q 1. Which activity was the easiest and which activity was the most difficult?

- *The easiest activity was 'true and false question' and the most difficult one was 'you have to remember.'*

Q 2. What things did you like most in the teaching routine and why?

- *Check pictures.*

Q 3. What things did you not like in the teaching routine and why?

- *No.*

Q 4. What things helped you to most understand the meaning of the words and why?

- *Review the words.*

Q 5. What things least helped you to understand the meaning of the words and why?

- *Read the definition without pictures.*

Self-regulation

Q 1. What things did you like most about using self-regulation form and why?

- *Self-assessment.*

Q 2. What things did you not like about using the self-regulation form and why?

- *No.*

Q 3. What things helped you to most understand the meaning of the words and why?

- *Self-assessment because it reminds me pictures.*

Q 4. What things least helped you to understand the meaning of the word and why?

- *I don't know.*

Q 5. If you are going to choose one of these methods to teach your kids, which one would you choose and why?

- *Self-assessment and recording (self-monitoring).*

Andrew

Direct vocabulary instruction routine

Q 1. Which activity was easiest and which activity was the most difficult?

- *The easiest activity was 'make a goal and doing the answer to pictures' and the most difficult one is 'None.'*

Q 2. What things did you like most in the teaching routine and why?

- *All of them.*

Q 3. What things did you not like in the teaching routine and why?

- *No.*

Q 4. What things helped you to most understand the meaning of the words and why?

- *No.*

Q 5. What things least helped you to understand the meaning of the words and why?

- *No.*

Self-regulation

Q 1. What things did you like most about using the self-regulation form and why?

- *Self-assessment because you remember, your brain.*

Q 2. What things did you not like about using the self-regulation form and why?

- *Self-recording (evaluation) because when you finish the test, compare my score and recorded score, that doesn't match. I don't like it.*

Q 3. What things helped you to the most understand the meaning of the words and why?

- *Self-assessment because when I remember some of them, I good to the test in that words.*

Q 4. What things least helped you to understand the meaning of the word and why?

- *No.*

Q 5. If you were going to choose one of these methods to teach your kids, which one would you choose and why?

- *Self-assessment because that really help.*

Brian

Direct vocabulary instruction routine

Q 1. Which activity was easiest and which activity was the most difficult?

- *The easiest activity was 'you make a goal' and the most difficult one is 'when we check it if I know the word.'*

Q 2. What things did you like most in teaching routine and why?

- *True or false questions.*

Q 3. What things did you not like in teaching routine and why?

- *I don't know.*

Q 4. What things helped you to most understand the meaning of the words and why?

- *True or false question because something is part of that thing, to word meaning, or something that is a part of meaning of the word.*

Q 5. What things least helped you to understand the meaning of the words and why?

- *I don't know.*
-

Self-regulation

Q 1. What things did you like most about using the self-regulation form and why?

- *Make a goal because you think you know four words, six words. Feel like you know a lot.*

Q 2. What things did you not like about using the self-regulation form and why?

- *I don't know.*

Q 3. What things helped you to most understand the meaning of the words and why?

- *Self-assessment.*

Q 4. What things less helped you to understand the meaning of the word and why?

- *I don't know.*

Q 5. If you were going to choose one of these methods to teach your kids, which one would you choose and why?

- *Self-assessment.*

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